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CORRESPONDENCE

RESPECTING THE

CAPTURE

MESSRS. JOHN AND JOHN ANTONIO BONNELL

BY

108657

SPANISH BRIGANDS

NEAR

GIBRALTAR.

Presented to the House of Commons by Command of Her Majesty, in pursuance of their Address dated June 20, 1870.

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RETURN to an Address of the Honourable the House of Commons, dated June 20, 1870;
for—

"Copy or Extracts of Correspondence with the Spanish Government relating to the recent Capture and Release of Englishmen by Spanish Brigands."

No. 1.

Sir R. Airey to the Earl of Clarendon.—(*Received May* 23.)

(Telegraphic.) *San Roque, May* 22, 1870, 1·25 P.M.

Messrs. John Bonnell and John Antonio Bonnell, highly respectable British subjects, were captured and carried off last evening by Spanish brigands, at about four miles from Gibraltar, in Spanish territory. I am in communication with Mr. Layard, and the Spanish authorities at San Roque and Algeciras.

No. 2.

The Earl of Clarendon to Mr. Layard.

(Telegraphic.) *Foreign Office, May* 23, 1870.

GOVERNOR of Gibraltar reports, that he has acquainted you with the capture of two British subjects by brigands, near that place. You will press the Spanish Government, in the most urgent terms, to take effectual measures for their safety and release, and for the punishment of the brigands, and report fully to me on the subject, and also to the Governor. It may be presumed they were residents at Gibraltar.

We earnestly request the Government to take warning by what has happened in Greece, and not to pursue the brigands with troops until the captives are released.

No. 3.

Mr. Layard to the Earl of Clarendon.—(*Received May* 23, 1·45 P.M.)

(Telegraphic.) *Madrid, May* 23, 1870, 9·40 A.M.

GOVERNOR of Gibraltar informs me that two British subjects, named Bonnell, were captured on Saturday evening by brigands, four miles from Gibraltar. I have seen Minister for Foreign Affairs; and orders were immediately sent to all authorities, military and civil, to do all in their power for the liberation of the captives, and to put them, if necessary, in communication with the Governor.

No. 4.

Mr. Hammond to Sir F. Rogers.

Sir, *Foreign Office, May* 23, 1870.

I AM directed by the Earl of Clarendon to transmit to you herewith, for the information of Lord Granville, a copy of a telegram which his Lordship has received from the Governor of Gibraltar, reporting the capture of two British subjects by Spanish brigands, near that place; and also the copy of a telegram which Lord Clarendon has addressed to Her Majesty's Minister at Madrid, with regard to this matter.*

I am, &c.
(Signed) E. HAMMOND.

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* Nos. 1 and 2.

No. 5.

Mr. Hammond to Sir F. Rogers.

Sir, *Foreign Office, May* 23, 1870.

WITH reference to my letter of this day, I am directed by the Earl of Clarendon to transmit to you, for the information of Earl Granville, the accompanying copy of a telegram which has been received from Her Majesty's Minister at Madrid,* relative to the capture by Spanish brigands of the two British subjects, near Gibraltar.

I am, &c.
(Signed) E. HAMMOND.

No. 6

Sir F. Rogers to Mr. Hammond.—(Received May 24.)

Sir, *Downing Street, May* 23, 1870.

I AM directed by Earl Granville to transmit to you, to be laid before the Earl of Clarendon, a copy of a telegram which has been received from the Governor of Gibraltar, reporting the capture by Spanish brigands, about four miles from Gibraltar, of two British subjects.

Lord Granville would be glad to receive Lord Clarendon's suggestions as to the course which should be taken in the matter, and will readily give any such instructions to the Governor of Gibraltar as may appear to his Lordship likely to aid in the release of the prisoners.

I am, &c.
(Signed) FREDERIC ROGERS.

Inclosure in No. 6.

Telegram from Sir R. Airey to Earl Granville, May 22, 1870.

[See No. 1.]

No. 7.

Mr. Layard to the Earl of Clarendon.—(Received May 24, 1 A.M)

(Telegraphic.) *Madrid, May* 23, 1870, 5·50 P.M.

I HAVE just been informed by Spanish Foreign Office that English captured subjects are supposed to have been taken to a hiding-place in the mountains near Ronda. The Minister of War and Minister of Interior will do all they can, and the Prefects and Mayors are instructed to act together for the liberation of the captives. General Prim has also assured me that no step will be omitted to secure this end.

No. 8.

Mr. Layard to the Earl of Clarendon.—(Received May 24, 2·15 P.M.)

(Telegraphic.) *Madrid, May* 24, 1870, 9·5 A.M.

YOUR telegram of yesterday received late last night. Every precaution appears, as far as I can judge, to have been taken, but I am without further information from the Governor of Gibraltar, and do not know whether a ransom has been demanded, and whether there be any means of communicating with the brigands. I am requested by the Spanish Government to assure your Lordship that nothing will be wanting on their part to insure the safety of the captives, and that they take upon themselves the payment of any ransom necessary for this purpose.

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* No. 3.

No. 9.

Mr. Hammond to Sir F. Rogers.

Sir, *Foreign Office, May* 24, 1870.

WITH reference to my letters of yesterday, I am directed by the Earl of Clarendon to transmit to you, for the information of Earl Granville, the accompanying copy of a further telegram from Mr. Layard,* relative to the capture of British subjects by Spanish brigands.

I am, &c.
(Signed) E. HAMMOND.

P. S.—I am at the same time to inclose herewith a copy of a further telegram which has just been received from Madrid,† and I am to request, that in laying the same before Earl Granville, you will move his Lordship to order Governor Airey, by telegraph, to keep Mr. Layard fully informed of everything that may come to his knowledge respecting this matter.

No. 10.

Sir F. Rogers to Mr. Hammond.—(Received May 24.)

Sir, *Downing Street, May* 24, 1870.

REFERRING to the letter from this office of yesterday, I am directed by Earl Granville to transmit to you a copy of a further telegram from the Governor of Gibraltar, on the subject of the capture of certain British subjects by brigands in Spain.

I am, &c.
(Signed) FREDERIC ROGERS.

Inclosure in No. 10.

Sir R. Airey to Earl Granville.

(Telegraphic.) *May* 23, 1870.

RETREAT of brigands not discovered yet. Spanish authorities most active in search. Brigands ascertained to be contrabandistas from Malaga; some of the party had previously visited Gibraltar, and invited Mr. Bonnell to purchase a horse. No tidings of or from the captives, nor any demand for a ransom.

No. 11.

Mr. Layard to the Earl of Clarendon.—(Received May 24, 8·20 P.M.)

(Telegraphic.) *Madrid, May* 24, 1870, 4 P.M.

I HAVE received a telegram from Her Majesty's Consul at Cadiz, informing me that detachments of Guardia Civil from Algeciras, San Roque, and Ronda, are in search of the brigands. Force not to be employed until security of captives is assured. Full powers given to negotiate, and, if necessary, ransom. In the absence of further and more satisfactory intelligence, the Governor of Cadiz will himself proceed this evening to the neighbourhood of Gibraltar.

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* No. 7. † No. 8.

No. 12.

Sir F. Rogers to Mr. Hammond.—(Received May 24.)

Sir, *Downing Street, May 24, 1870.*

IN reply to your letter of this day on the subject of the capture by Spanish brigands of British subjects in the south of Spain, I am directed by Earl Granville to acquaint you, for the information of the Earl of Clarendon, that his Lordship sent the following telegram to the Governor of Gibraltar at 20 minutes past 4 this afternoon:—

"Keep Mr. Layard fully informed, by telegraph, of any information you may obtain respecting the captives, and act in complete concert with him."

I am, &c.
(Signed) FREDERIC ROGERS.

No. 13.

Sir F. Rogers to Mr. Hammond.—(Received May 25.)

Sir, *Downing Street, May 25, 1870.*

WITH reference to my letter of yesterday, I am directed by Earl Granville to transmit to you, for the information of the Earl of Clarendon, a copy of a further telegram which has been received from the Governor of Gibraltar on the subject of the English who have been captured by brigands in Spain.

I am, &c.
(Signed) FREDERIC ROGERS.

Inclosure in No. 13.

Sir R. Airey to Earl Granville.

(Telegraphic.) *San Roque, May 24, 1870, 4·46 P.M.*

RECEIVED your telegram of yesterday. I have just sent the following message to Mr. Layard by telegraph:—

"Three Spaniards now in Gibraltar are willing to proceed into Spain, and endeavour to effect release of captives. Am assured their efforts are likely to succeed. One named Gabaron refuses to go without safe-conduct from Spanish Government, being politically compromised; the others will not go without him. Urge Spanish Governor to authorize Spanish Consul here to grant safe-conduct. We have no tidings of any kind of the captives or brigands."

No. 14.

Mr. Hammond to Sir F. Rogers.

Sir, *Foreign Office, May 25, 1870.*

I AM directed by Her Majesty's Secretary of State for Foreign Affairs to transmit to you, to be laid before Earl Granville, copies of further correspondence, as marked in the margin,* upon the subject of the capture of Messrs. Bonnell by Spanish brigands.

I am, &c.
(Signed) E. HAMMOND.

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* No. 11.

No. 15.

Mr. Layard to the Earl of Clarendon.—(*Received May* 26.)

(Telegraphic.) *Madrid, May* 26, 1870, 3·25 P.M.

I HAVE received the following telegram from Sir Richard Airey, 25th May :—

"Arrangements have just been made with Spanish Consul for safe-conduct to Raphael Gabaron, who went off this morning before daylight to negotiate with brigands for ransom of captives, with instructions to return with all possible expedition to Gibraltar. Still without tidings from the captives."

No. 16.

Mr. Layard to the Earl of Clarendon.—(*Received May* 26.)

My Lord, *Madrid, May* 23, 1870.

I RECEIVED, at a quarter-past 10 o'clock last night, a telegram from Sir Richard Airey, informing me that Messrs. John Bonnell and John Antonio Bonnell, highly respectable British subjects, had been captured and carried off on the previous evening by Spanish brigands, at about four miles from Gibraltar, in Spanish territory.

His Excellency further stated, that he was in communication with the Spanish authorities at San Roque and Algeciras.

I lost no time in sending a note to the Minister of State, to inform him of this occurrence, and to request him earnestly to take, without delay, all possible measures for the liberation of the captives. My messenger, after some difficulty, found Señor Sagasta, and about 1 o'clock in the morning his Excellency came to me with Señor de Blas, the Under-Secretary of State for Foreign Affairs. He was very much troubled with the news which I had sent to him, and expressed the greatest regret that such an event should have occurred in Spanish territory. He begged me to assure your Lordship that no exertions should be wanting, or expense spared, on the part of the Spanish Government, to obtain the liberation of the captives, and to insure the punishment of the criminals.

As soon as his Excellency had received my note he went to Señor Rivero, the Minister of the Interior, and had placed himself in communication with General Prim. Telegrams had been sent to the Captain-General of the province, to the Governor of Cadiz, and to all the civil and military local authorities, ordering them to take every available measure for the release of the captives.

His Excellency requested me, in order to save time, to communicate directly with the Minister of the Interior, should I receive any further information from Sir Richard Airey.

I have informed Sir Richard Airey of what has taken place here, and have requested him to furnish me with any further details which may be of use for the information of the Spanish Government.

I will not fail to do everything in my power for the captives here. I feel sure, however, that Señor Sagasta will require no urging on my part, but that he will take every available measure, and do his utmost for their release.

I have, &c.

(Signed) A. H. LAYARD.

No. 17.

Sir F. Rogers to Mr. Hammond.—(*Received May* 26.)

Sir, *Downing Street, May* 26, 1870.

REFERRING to previous correspondence, I am directed by Earl Granville to transmit to you, for the Earl of Clarendon's information, a copy of a further telegram from the Governor of Gibraltar, reporting the departure of Gabaron or Gabbron to negotiate with the Spanish brigands for the release of the captives.

I am, &c.

(Signed) FREDERIC ROGERS.

Inclosure in No. 17.

Telegram from Sir R. Airey to Earl Granville, May 25, 1870, 12·4 P.M.

[See No. 15.]

No. 18.

Mr. Hammond to Sir F. Rogers.

Sir, *Foreign Office, May* 26, 1870.

I AM directed by Her Majesty's Secretary of State for Foreign Affairs to transmit to you, to be laid before Earl Granville, the accompanying copy of a telegram from Mr. Layard relative to the capture of Messrs. Bonnell by Spanish brigands.*

I am, &c.

(Signed) E. HAMMOND.

No. 19.

The Earl of Clarendon to Mr. Layard.

Sir, *Foreign Office, May* 27, 1870.

I HAVE received your despatch of the 23rd instant, reporting the capture by Spanish brigands near Gibraltar of two British subjects; and I have to convey to you my approval of the steps you have taken, as reported in that despatch, with a view to obtain the release of the captives.

I am, &c.

(Signed) CLARENDON.

No. 20.

Mr. Layard to the Earl of Clarendon.—(*Received May* 27.)

My Lord, *Madrid, May* 24, 1870.

IN continuation of my despatch of yesterday, I have the honour to inform your Lordship that I took the earliest opportunity yesterday of seeing General Prim, and of speaking to him on the subject of the capture of the Messrs. Bonnell, urging him to do all that was possible for their liberation, and especially to avoid any step which might endanger their safety, His Excellency replied that he had seen Señor Sagasta during the night, and had also been in communication with Señor Rivero, the Minister of the Interior, and that they had concerted such measures between the military and civil authorities, as he had reason to hope would lead to the release of Messrs. Bonnell. He had telegraphed the most precise instructions to the Captain-General of Andalusia and to the military authorities at Cadiz, Algeciras, San Roque, Ronda, and other places in the neighbourhood of the scene of the outrage. His Excellency further begged me to assure Her Majesty's Government that every effort should be made by the Spanish Government to insure the safety of the captives.

Whilst I was with General Prim, Señor de Blas, the Under-Secretary of State for Foreign Affairs, called upon me to communicate a telegram, which the Minister of the Interior had received from the Alcalde of Algeciras, stating that, since yesterday measures had been taken for the liberation of the two British subjects, and that the general opinion was that they had been carried off to some hiding-place in the mountainous country about Ronda. Señor de Blas, further, left me a private note to say that he had himself been to see that the Departments of War and the Interior had been put in motion; the Prefects and Mayors, he added, were acting together in order to obtain a favourable result.

I telegraphed at once to Sir Richard Airey to inform him that it was supposed that the captives were in the mountains of Ronda. Later in the day, Señor de Blas communicated to me a telegram from the Governor of Cadiz to the Minister of the Interior stating that two lines ("lineas") of civil guards were being concentrated on San Roque, and that no means should be omitted to insure the release of Messrs. Bonnell.

* No. 15.

At 10·30 o'clock last night I received your Lordship's telegram, dispatched from London at 12·55, in which your Lordship instructs me to press upon the Spanish Government, in the most urgent terms, to take effectual measures for the safety and release of Messrs. Bonnell, and for the punishment of the brigands, and to state that Her Majesty's Government earnestly request the Spanish Government to take warning by what has happened in Greece, and not to pursue the brigands with "corps" until the captives are released.

Although I had in my communication with General Prim and Señor Sagasta expressed myself almost in the identical terms which I was thus instructed to use by your Lordship, I thought it very desirable to communicate at once to the Spanish Government the contents of your Lordship's telegram, in order that they might fully understand the gravity which your Lordship attached to the capture of Messrs. Bonnell. I was unable, however, to find either Señor Sagasta or Señor Rivero at the Cortes, nor was the former at his residence, or at the Foreign Office. At length I succeeded in finding Señor de Blas, who has been more directly charged with the management of this affair, and I communicated to him the contents of your Lordship's telegram. He assured me that, both in the Ministry of the Interior, and of War, every exertion was being made to obtain the release of Messrs. Bonnell, but that, up to that moment, no positive information had been received of the movements of the brigands, nor was it known where they were, nor what might be the nature of their demands; that the Government had determined to use every precaution to insure the safety of the captives, and that being well aware of its obligations and duties, it would itself pay any ransom which might be required for that purpose. He further informed me that the Government had reason to believe that the Governor of Cadiz had obtained some clue to the connections of the brigands, which there was ground to hope might lead to a favourable result.

Señor Sagasta, at my first interview with him, had stated that it was the intention of the Government to punish with the utmost severity the authors of the crime—"They must be hung," he said.

Señor de Blas having sent to inquire whether any further information had been received at the Ministry of the Interior, received, in reply, the copy of a telegram just in from the Governor of Cadiz, stating that the measures undertaken for the release of the English captives were being actively prosecuted, and that there was reason to believe that the brigands had originally come from the Province of Malaga, and had now gone in that direction. Upon the receipt of this information a telegram had at once been sent to the Governor of Malaga in these terms:—

"The most active steps are being taken for the release of two English subjects, captured near Gibraltar, according to information received, by evil-doers of that Province. Take the same yourself, unremittingly bringing into play all means in your power, sparing no expenses, all of which are paid by the Government: make this known to the Alcaldes of the villages. Employ all forces or persons who are capable of securing the result desired by the Government, who consider this act as one affecting the national honour, and as requiring very special service."

Thinking it desirable to see Señor Rivero myself, I proceeded with Señor de Blas to the Ministry of the Interior, where, at 1·15 in the morning we found his Excellency. He fully confirmed to me all that Señor de Blas had stated, declaring that the honour of the Spanish Government was concerned, and that it was determined at whatever sacrifice or expense to liberate the English captives, and that he had given secret instructions to the authorities to effect this without endangering the lives of the captives, whatever might be the nature of the steps they felt it necessary to take.

Señor Rivero expressed himself deeply concerned at what had happened, and begged me to assure your Lordship, which I have done by telegraph, that nothing should be wanting on the part of the Spanish Government to insure the safety of the captives, and their liberation, and that it took upon itself the payment of any ransom that may be necessary for this purpose.

Early this morning I telegraphed to Her Majesty's Consuls at Cadiz and Malaga, requesting them to ascertain immediately from the Governors of those cities what steps they were taking for the liberation of Messrs. Bonnell, and instructing them to keep me fully informed on the subject. I reminded them, at the same time, that the first consideration was the safety of the captives, and that nothing should be done by movements of troops, or otherwise, to endanger it.

I have, further, written despatches to them, of which I inclose a copy. I also telegraphed to Sir Richard Airey, requesting him to inform me whether any ransom had been asked for the captives, and whether any agent for the brigands had appeared to treat for it, and informing his Excellency that the Spanish Government was disposed to do

everything in its power, but that, without knowing more, I did not know what to suggest.

Up to this time I have only been made acquainted by Sir Richard Airey with the bare fact of the capture of Messrs. Bonnell; and, without further information, it is of course impossible for me to give any opinion as to the best course to be pursued with regard to them.

I have further written a despatch to Sir Richard Airey, of which I inclose a copy.

I have, &c.

(Signed) A. H. LAYARD.

P.S.—Since writing this despatch, I have received a telegram from Mr. Reade, Her Majesty's Consul at Cadiz, of which I have sent your Lordship a copy by telegraph. It would appear, from this communication, that the Spanish Government has fulfilled the promises which it has made to me; and I trust that, if the Governor of Cadiz carries out in their proper spirit the instructions which he has received, the captives will soon be released.

A. H. L.

Inclosure 1 in No. 20.

Mr. Layard to Her Majesty's Consuls at Malaga and Cadiz.

Sir, *Madrid, May* 24, 1870.

I TELEGRAPHED to you this morning to ascertain immediately from the Governor of Malaga and Cadiz what steps he was taking for the liberation of Messrs. Bonnell, two English subjects captured by brigands, and to keep me fully informed on the subject. I further informed you that the first consideration was the safety of the captives, and that nothing should be done, by movement of troops or otherwise, to endanger it. The Spanish Government, I added, was desirous of doing everything in its power to procure their liberation.

I must press upon you the extreme importance of avoiding any measures on the part of the military authorities which might lead to such a deplorable result as that recently witnessed in Greece.

The President of the Council and the Ministers of War and of the Interior have expressed themselves to me in the most satisfactory manner, and have assured me that they have urged the greatest caution and prudence in their instructions to the military and civil authorities, and that they are prepared to pay any ransom which may be necessary for the release of the captives. Such being the case, there ought not to be any ground for serious apprehension for the safety of the captives, and you will impress upon his Excellency the Governor the grave responsibility which would be incurred by the local authorities if, owing to imprudence or neglect of their instructions, anything should happen to the Messrs. Bonnell.

I am informed that the Governor of Cadiz has been especially instructed to deal with this case, and that there is reason to believe that he has found some clue to the connections of the brigands, which may lead to important results.*

If you can obtain any information upon this subject, you will not fail to communicate it to me, and also to the Governor of Gibraltar, to whom you will also transmit any information that you may obtain with reference to the captives.

I am, &c.

(Signed) A. H. LAYARD.

Inclosure 2 in No. 20.

Mr. Layard to Sir R. Airey.

Sir, *Madrid, May* 24, 1870,

SINCE your Excellency's telegram announcing the fact of the capture of the Messrs. Bonnell by brigands, I have not received any further information from your Excellency.

* This paragraph is addressed only to Consul Reade.

I consequently requested your Excellency this morning, by telegraph, to inform me whether any ransom had been asked by the brigands, and whether any agent from them had appeared to treat.

It is of great importance that I should be furnished without delay with all the information which can be obtained on this as well as on other points, in order that I may make such communications as may be necessary to the Spanish Government.

I have seen General Prim, and the Ministers of War and of the Interior, and they have expressed to me their deep concern at what has taken place, and their determination to leave no means untried to ensure the safety of the captives and their speedy release. In order to effect this the most explicit instructions, they inform me, have been sent to the Captain-General of Andalusia, to the Governors of Cadiz and Malaga, and to the local authorities, civil and military.

I am further informed that all these officers are ordered to place themselves in communication with your Excellency, if necessary.

I have urged upon the Spanish Government, by Lord Clarendon's directions, not to pursue the brigands until the captives are released.

The Spanish Ministers have assured me that no step will be taken which will endanger the lives of the captives, and they state that they are prepared themselves to pay any ransom which may be necessary for their release.

According to the account received last night at a late hour at the Ministry of the Interior, the brigands who committed this outrage are from the Province of Malaga, and are now moving in that direction.

Instructions are at once sent by telegraph to the Governor of that province to take measures accordingly. It would, I think, be very desirable that you should communicate, if you have not done so already, with the Captain-General of Andalusia, and with the Governor of Cadiz, giving them every information which you may possess. The latter has been specially charged with the duty of tracing the brigands, and I am informed that he believes that he has found some clue to their connections, which may lead to a favourable result.

It is suspected that there must have been an organized plan for the capture of Messrs. Bonnell, in connection with some person or persons at Gibraltar, as for some time past the roads in the south of Spain were considered perfectly safe, and they have been traversed by travellers, strangers as well as natives, without any apprehension, and without any escort.

I have telegraphed to Her Majesty's Consuls at Cadiz and Malaga to place themselves in communication with the Governors of those cities, and to keep me informed of the steps they may take for the release of the captives. I have also reminded them that the first consideration is the safety of the captives, and that nothing should be done, by movement of troops or otherwise, which might endanger it.

It might, perhaps, also be advisable for your Excellency to communicate with these gentlemen.

I have, &c.
(Signed) A. H. LAYARD.

No. 21.

The Earl of Clarendon to Mr. Layard.

Sir, *Foreign Office, May* 27, 1870.

WITH reference to your despatch of the 24th instant, I have to state to you that I approve all that you are doing with a view to the liberation of the Messrs. Bonnell from the hands of the Spanish brigands.

I am, &c.
(Signed) CLARENDON.

No. 22.

Mr. Layard to the Earl of Clarendon.—(Received May 28.)

My Lord, *Madrid, May 25, 1870.*

SOON after I had forwarded to your Lordship my despatch of yesterday, I received a telegram from Mr. Reade, Her Majesty's Consul at Cadiz, to whom I had telegraphed early in the morning, informing me that detachments of Guardia Civil from Algeciras, San Roque, and Ronda were in search of the brigands; that force was not to be employed until the security of the captives had been assured; that full powers had been given to negotiate, and, if necessary, to ransom them, and that in the absence of further and more satisfactory intelligence, the Governor would himself proceed that evening to the neighbourhood of Gibraltar.

I immediately transmitted a copy of this telegram to your Lordship and to General Sir Richard Airey. Soon after I heard from the Ministry of the Interior that the Governor had received directions to proceed at once to San Roque.

Later in the day I received a telegram from Mr. Mark, Her Majesty's Consul at Malaga, informing me that, on the receipt of my telegram, he had immediately sought an interview with the Governor of that place, who had received instructions from Madrid and replied thereto, and had taken active measures, though not ostensibly, for the recovery of the captives. The Governor was ignorant of their exact present position, but confided in the exit of his operations, and concurred with me in the necessity of first saving the lives of the captives, and would act under that conviction. I inclose a copy of Mr. Mark's telegram.

Late in the afternoon I received a letter from Señor Rivero, the Minister of the Interior, inclosing for my information copies of the telegrams which had passed between himself and the Governors of Cadiz and Malaga and other local civil authorities, and assuring me that if I could suggest any other steps in addition to those already taken, "I might rely upon their being carried out with all the energy of his authority for the sake of my unfortunate fellow-countrymen, in whom he took the deepest interest."

Although several of the telegrams, copies of which were sent to me by Señor Rivero, have already been communicated to your Lordship, I have thought it advisable to send your Lordship the complete series.

As it appeared to me that the accounts which I had received from Her Majesty's Consuls at Cadiz and Malaga were satisfactory, and that any suggestions here, without a full knowledge of the circumstances of the case, might perhaps rather tend to create confusion than otherwise, I thanked Señor Rivero for the lively interest which he had shown in this matter, and informed him that I did not find anything to add to the instructions already given by his Excellency, and that I would not embarrass the authorities, who were perfectly acquainted with the country and with the persons with whom they had to deal, by making suggestions which might be valueless. I, however, reminded Señor Rivero that Her Majesty's Government considered it of the greatest importance that the Spanish troops should not make any movements which might place the captives in serious danger, and that the first consideration was to save their lives. I knew, I added, that his Excellency had given precise instructions upon this point to the local authorities, but I begged him to insist again with regard to it in future communications with the Governor of Cadiz.

In the evening I received a telegram from the Governor of Gibraltar, of which I inclose a copy, informing me that three Spaniards, then in Gibraltar, were willing to proceed into Spain and endeavour to effect the release of the captives, and that his Excellency was assured that those efforts were likely to succeed. One named Gabaron refused, however, to go without a safe-conduct from the Spanish Government, being politically compromised, and the others would not go without him. His Excellency requested me to urge the Spanish Government to authorize the Spanish Consul at Gibraltar to grant the safe-conduct. His Excellency added that they had no tidings of any kind of the captives or brigands.

I lost no time in instructing Mr. Hunt, Chancelier of this Legation, to see Señor Sagasta, or Señor Rivero, or one of the Ministers, and to communicate to him the contents of Sir Richard Airey's telegram. Mr. Hunt succeeded, after some time, in finding Señor Rivero and Señor Sagasta at the Cortes.

Señor Sagasta at once consented to telegraph to the Consul at Gibraltar to grant the safe-conduct required, if it appeared to him that the offer of Señor Gabaron was really a *bonâ fide* one. Señor Rivero then telegraphed to the Governor of Cadiz (who is charged

with the duty of releasing the captives), informing him of the contents of Señor Sagasta's telegram to the Spanish Consul at Gibraltar, and I immediately informed Sir Richard Airey by telegraph.

I inclose a memorandum from Mr. Hunt of what occurred.

I subsequently received a further telegram from Sir Richard Airey, in which he informs me that nothing more had been heard of Messrs. Bonnell, that no ransom had been asked, and that no agent from the brigands had appeared to treat. The brigands, he states, were supposed to have retired to the Sierra Vermeja, running south-east and north-west towards Ronda, an inaccessible country. Two messengers had proceeded privately to find and treat with them for the release of the captives.

I have since received a despatch from Sir Richard Airey, with fuller accounts of the capture of Messrs. Bonnell. I send your Lordship a copy of one of the inclosures, which gives the only details, which may not yet have reached your Lordship.

I have, &c.

Signed) A. H. LAYARD.

P. S.—Since writing the above I have received a telegram of this day's date from Sir Richard Airey, and the text of which I have just repeated to your Lordship, saying "that arrangements have been made with the Spanish Consul for the safe-conduct for Raphael Gabaron, who went off this morning before daylight to negotiate with brigands for ransom of captives, with instructions to return with all possible expedition to Gibraltar. Still without tidings from the captives."

Inclosure 1 in No. 22.

Consul Mark to Mr. Layard.

(Telegraphic.) *Malaga, May* 24, 1870.

TELEGRAM reached me 11·30. Immediate interview with Governor Somora, who had received instructions from Madrid and replied thereto. Has taken active measures, though not ostensibly, for recovery of captives; ignores their exact present position, but confides in the exit of his operations; concurs with your Excellency in the necessity of first saving lives of the captives, and will act under that conviction.

Inclosure 2 in No. 22.

Telegrams between the Minister of the Interior and the Governors of Cadiz, Malaga, &c.

(Translation.)

(No. 1.)

The Governor of Cadiz to the Minister of the Interior.

Cadiz, May 22, 1870, 9·25 P.M.

AT a few paces from the frontier line of Gibraltar, two Englishmen of that place have been captured by five criminals. I have given orders that all possible steps shall be taken for the rescue of the captives.

(No. 2.)

The Minister of the Interior to the Governor of Cadiz.

May 22, 1870, *midnight.*

I have your telegram of to-day. Make all possible efforts for rescue of captives. National honour at stake.

(No. 3.)

The Minister of the Interior to the Governor of Cadiz.

May 22, 1870, *half-past* 12 *at night.*

Spare no effort for rescue of captives mentioned in my first telegram, including that of making use of sums of money that may be necessary. Above all, at all risks, avoid endangering their lives.

(No. 4.)

The Governor of Cadiz to the Minister of Interior.

Cadiz, May 23, 1870, 8 A.M.

I have understood your cypher telegram. I shall send a confidential messenger.

(No. 5.)

The Minister of the Interior to the Alcaldes of Algeciras, Los Barrios, and San Roque.

May 23, 1870, 1 *o'clock.*

Besides the orders which you will have received to procure the release of the British subjects captured near Gibraltar, I particularly charge you to employ all zeal and diligence to obtain their freedom. You will already know that the honour and dignity of Spain are at stake in this matter. If it is necessary to incur expense for this purpose, the Government pays. Above all, at all risks, avoid endangering their lives.

(No. 6.)

The Alcalde of Algeciras to the Minister of the Interior.

Algeciras, May 23, 1870, 12 *minutes past* 12.

Since yesterday measures adopted for rescue of British subjects. General opinion is that they are taken to some hiding-place in the mountains of Ronda.

(No. 7.)

The Minister of the Interior to the Alcalde of Algeciras.

May 23, 1870, 2 P.M.

Continue to search for captives, and to inform me of anything that may conduce to that object.

(No. 8.)

The Minister of the Interior to the Alcalde of Ronda.

May 23, 1870, 2 P.M.

I am informed that the English subjects Bonnell, captured yesterday near San Roque, are hidden in the mountains of your district. I appeal to your patriotism on this occasion, which affects the national honour, to employ all activity for the rescue of the prisoners, sparing no measures or expense, the Government paying all, considering this as a special service.

(No. 9.)

The Governor of Cadiz to the Minister of the Interior.

Cadiz, May 23, 1870, 2·12 P.M.

Two lines of Civil Guard, commanded by a Captain, are being concentrated on San Roque. I am sparing no means to obtain the release of Messrs. Bonnell.

(No. 10.)

The Minister of the Interior to the Governor of Cadiz.

May 23, 1870, 2·45 P.M.

Your to-day's telegram received. It is well; and I rely on your untiring zeal for the release of Messrs. Bonnell.

(No. 11.)

The Governor of Cadiz to the Minister of the Interior.

Cadiz, May 23, 1870, 9·15 P.M.

Steps taken for rescue of British captives are being actively carried on. It is believed that the criminals come from the Province of Malaga, and that they will have returned there.

(No. 12.)

The Minister of the Interior to the Governor of Cadiz.

May 23, 1870, 10·30 P.M.

Your telegram of to-day received and understood. Although I have telegraphed to the Alcaldes of Algeciras, Los Barrios, and San Roque, and you will also have done so stimulate afresh their zeal in a matter so deeply affecting national honour.

(No. 13.)

The Minister of the Interior to the Governor of Malaga.

May 23, 1870, 10·30 P.M.

The most active steps are being taken for the rescue of the two British subjects captured near Gibraltar, according to information received, by criminals of your province. Act in a like sense without ceasing, calling into play all means in your power. Spare no expense: all is paid by the Government. Make this known to the Alcaldes of the towns. Make use of all forces and persons who may be able to effect the result desired by the Government, who consider this act as affecting the national honour, and the duty as an especial one.

(No. 14.)

The Governor of Malaga to the Minister of the Interior.

Malaga, May 23, 1870, 12·40 *at night.*

Orders duly given to Guardia Civil to pursue bandits and rescue captured English. In view of to-night's telegram fresh measures will be taken.

(No. 15.)

The Minister of the Interior to the Governor of Cadiz.

May 24, 1870, 1·30 P.M.

If your Excellency thinks that your going in person to the place where the capture was made might serve to hasten the pursuit of the criminals, or even to obtain information of the captives, do so without a moment's delay. The Government spares neither expense nor sacrifice to obtain their release. The great danger is their murder: this must be avoided at all risks.

(No. 16.)

The Minister of the Interior to the Governor of Malaga.

May 24, 1870, 1·30 P.M.

Your telegram of 12·40 at night received.

If you think that by going in person to Ronda, in the mountains of which place the criminals and their captives are supposed to be, you can hasten the pursuit, &c. [word for word as in No. 15.]

(No. 17.)

The Governor of Cadiz to the Minister of the Interior.

Cadiz, May 24, 1870, 9 A.M.

In obedience to your Excellency's wishes, which agree with my intentions, I am preparing to depart for San Roque.

Inclosure 3 in No. 22.

Sir R. Airey to Mr. Layard.

(Telegraphic.) *Gibraltar, May* 24, 1870.

NOTHING more has been heard of Messrs. Bonnell. No ransom has been asked. No agent from brigands has appeared to treat. The brigands are supposed to have retired to the Sierra Vermeja, running south-east and north-west towards Ronda; inaccessible country.

Two messengers have proceeded privately to find and treat with brigands for release of captives.

Inclosure 4 in No. 22.

Memorandum.

Madrid, May 25, 1870.

ON receiving into my hands yesterday evening Sir R. Airey's telegram, concerning the willingness of Gabaron and two other Spaniards to proceed from Gibraltar to Spain, in order to endeavour to procure the release of the Messrs. Bonnell, and stating that Gabaron demanded to be furnished with a safe-conduct from the Spanish Government, I went in search of the Minister of the Interior, in pursuance of my instructions.

Not having found his Excellency either at the Home Department or at his private residence, I proceeded to the Cortes, where, on the rising of the House, the Under-Secretary for Foreign Affairs led me into the presence of his Excellency, with whom was Señor Sagasta.

I acquainted them with the contents of Sir R. Airey's telegram, and Señor Sagasta immediately telegraphed to the Spanish Consul at Gibraltar, instructing that functionary to come to an understanding with Sir R. Airey, and to grant the safe-conduct, if necessary, and if he considered Gabaron's offer to be a sincere one, bearing in mind that the Government intended to leave no stone unturned for the release of the captives.

Señor Rivero then inquired, by telegraph, whether the Governor of Cadiz was still in that city, and having received an answer to the effect that he would not set out from

Cadiz until daybreak this morning, Señor Rivero at once dispatched a telegram to him, informing him of the contents of Señor Sagasta's telegram to the Spanish Consul at Gibraltar, enjoining him, in the strongest terms, to afford all the aid in his power, and concluding by investing him with full authority to do everything that he (Señor Rivero) might legally perform in person.

Both their Excellencies, and Señor de Blas, the Under-Secretary of State, repeatedly assured me of their earnest desire to bring this matter to a satisfactory conclusion, and stated that their efforts had been, and should be, unremitting.

I thanked their Excellencies and withdrew, after having telegraphed to Sir R. Airey the result of the interview.

(Signed) W. G. LENNON HUNT.

Inclosure 5 in No. 22.

Deposition of Joseph Varese.

I, JOSEPH VARESE, do hereby certify, that having learned yesterday evening that Mr. John Bonnell and his nephew had not returned from their usual ride, I thereupon went early this morning to the Lines, with the object of learning their whereabouts. That on my arrival there, I was desired to call upon the Guardia Civil, from whom I could get information; and I was there informed by a soldier of said corps, named Alvarez, that according to the report received by them early this morning, it appears that Mr. Bonnell and nephew were taken by surprise by five individuals yesterday evening, in the farm called Sabal. That these individuals tied and locked up the women employées of this farm, in a room; and that about 8 o'clock last night the Messrs. Bonnell were taken away by said individuals. I was further informed that Sergeant Molina, of the Guardia Civil, with some soldiers of this corps of infantry, left the Lines early this morning in pursuit of the brigands.

Gibraltar, May 22, 1870.

(Signed) JOSEPH VARESE.

No. 23.

Mr. Layard to the Earl of Clarendon.—(Received May 29.)

My Lord, *Madrid, May* 26, 1870.

I HAVE no further intelligence to-day on the subject of the capture of the Messrs. Bonnell by brigands. I inclose a copy of a letter which I have received from Mr. Reade, Her Majesty's Consul at Cadiz, which is nearly to the same effect as his telegram already forwarded to your Lordship, but which, being somewhat fuller, will enable your Lordship to judge more accurately of the steps that are being taken by the Spanish authorities for the release of the captives.

I have, &c.

(Signed) A. H. LAYARD.

Inclosure in No. 23.

Consul Reade to Mr. Layard.

Sir, *Cadiz, May* 24, 1870.

I HAVE the honour to acknowledge the receipt of your Excellency's telegram of this day's date, instructing me to ascertain immediately from the Governor of this province what steps he is taking for the liberation of Messrs. Bonnell, two British subjects, captured by brigands, and to keep your Excellency duly informed. I am further advised that, the safety of the captives being the first consideration, nothing should be done, by moving troops, or otherwise, to endanger it.

On receipt of the above telegram, I called upon the Governor, and obtained from him the information I this day telegraphed to your Excellency in a condensed form, viz.:—

That an active search after the brigands has already been instituted, under the direction of the Guardia Civil, which, as your Excellency must be aware, is the most trustworthy force in the country; that no military operations whatever will be undertaken

against the brigands, so long as the captives are in their power; and that, on the contrary, authority is given to the Commandant of the Guardia to procure the captives' liberation by peaceful means, and the payment of any ransom which may be necessary for the purpose.

The Governor appears confident that the lives of the captives are safe, and hopes, before many hours, to hear of their release. Should he not, however, receive intelligence to that effect, before this evening, it is his intention to repair at once to the neighbourhood of Gibraltar, with a view to facilitate the termination of this disagreeable affair.

His Excellency expresses himself as being profoundly solicitous of the personal security and comfort of the captives; and assures me he will spare neither trouble nor expense to effect their liberation.

Until the arrival of your Excellency's telegram, I had received no intelligence whatever regarding the capture of the Messrs. Bonnell; but I conclude a report of the occurrence from my Vice-Consul at San Roque is on the way. I have since arranged to receive prompt and reliable information regarding the further proceedings of the Spanish authorities, and shall not fail to communicate the same to your Excellency as soon as it may reach me.

I have, &c.
(Signed) T. F. READE.

No. 24.

Mr. Hammond to Sir F. Rogers.

Sir, *Foreign Office, May* 30, 1870.

WITH reference to your letter of the 26th instant, and to previous correspondence, I am directed by the Earl of Clarendon to transmit to you, for the information of Earl Granville, copy of a despatch and of its inclosures, as marked in the margin,* which I have received from Her Majesty's Minister at Madrid, on the subject of the late capture by brigands of two British subjects in the neighbourhood of Gibraltar.

I am, &c.
(Signed) E. HAMMOND.

No. 25.

Mr. Layard to the Earl of Clarendon.—(Received May 30.)

My Lord, *Madrid, May* 26, 1870.

I HAVE the honour to transmit to your Lordship herewith copies of further correspondence on the subject of the capture of Messrs. Bonnell by Spanish brigands.

I have, &c.
(Signed) A. H. LAYARD.

Inclosure 1 in No. 25.

Sir R. Airey to Mr. Layard.

Sir, *Gibraltar, May* 23, 1870.

I HAVE received your Excellency's telegram dated Madrid 23rd instant, 8·45 A.M., and, in compliance with your Excellency's desire, I hasten to transmit for your information copies of all the communications which I have received from the Spanish authorities in the vicinity, and from Mr. Francis Francia, Her Majesty's Vice-Consul in San Roque.

From these documents your Excellency will perceive that no effort has been wanting on the part of the Spanish authorities, civil and military, in doing everything possible for the liberation of the captives and the discovery of the retreat of the brigands.

No tidings have been received at Gibraltar of or from the captives, and no demand, direct or indirect, from the brigands for a ransom.

I have, &c.
(Signed) RICHARD AIREY.

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* No. 22.

Inclosure 2 in No. 25.

Señor Gatrid to Sir R. Airey.

(Translation.)

Sir, *Linia, May* 22, 1870.

HAVING taken cognizance of the communication which you had the goodness to make me with reference to the capture of Messrs. John Bonnell and his nephew, which crime took place last night in the inn of Sabal by five scoundrels on horseback, I have to inform you that I was informed of the fact this morning at 6·30 by the force of Civil Guards stationed at this place, who went in pursuit of the criminals; and I immediately ordered the departure of a serjeant with ten soldiers, that they might operate in conjunction with the former for the capture of the criminals, or might, at least, rescue the persons captured.

I lament such an unheard-of act, the more so as all the night having elapsed, the brigands may have got off to some distance, thus making it difficult to discover them so quickly as I desire.

To-night the body of Civil Guards will return, and all news they may have gained I will duly communicate to you with the assurance that all means humanly possible shall be employed to gain the desired end.

God preserve, &c. (Signed) LUIS GATRID.

Inclosure 3 in No. 25.

Señor Gatrid to Sir R. Airey.

(Translation.)

Sir, *Linia, May* 23, 1870.

AT this moment there has arrived here the chief Captain of the Civil Guard, informing me that the pursuit of the brigands is being actively carried on in this province and in that of Malaga, where a telegram has been sent in order to discover the Messrs. Bonnell and the criminals who seized them. The latter are from Malaga, and were eight days ago in the inn of Sabal with their papers in proper order, and stating that they were smugglers; some of them had come into this place and treated of the sale of a horse to Mr. Bonnell, who for this reason had dealings with them, unsuspecting the snare set for him, to which he has now fallen a victim.

Judging by the great activity displayed in their pursuit, it is probable that the Messrs. Bonnell will very shortly be discovered and rescued.

All of which I have the honour to communicate.

God preserve, &c. (Signed) LUIS GATRID.

Inclosure 4 in No. 25.

Vice-Consul Francia to Sir R. Airey.

My dear Sir Richard, *Sunday, May* 22, 1870.

NO time has been lost in informing the authorities here of the capture of the Messrs. Bonnell by brigands, and they will, I feel persuaded, do all in their power for the release of the prisoners and the discovery of the robbers. I do not see that anything more can be done at this moment, but I will take care to keep you informed of anything that may be learned by the authorities concerning it. I will reply to your official communication to-morrow, and perhaps by that time we may have heard something more on the subject.

Very faithfully, &c.
(Signed) FRANCIS FRANCIA.

P.S.—The Alcalde has this moment informed me that at about 8 o'clock this morning orders were sent to Los Barrios and Zimina for the Guardia Civil of both places to put themselves in motion for the purpose of discovering the whereabouts of the Messrs. Bonnell and the robbers.

Inclosure 5 in No. 25.

Vice-Consul Francia to Sir R. Airey.

Sir, *San Roque, May* 23, 1870.

FROM my hurried note of yesterday, by Captain Monsell, your Excellency will have seen that no time was lost in making known to the authorities here the information contained in your letter of yesterday's date regarding the carrying off by brigands of Mr. Bonnell and his nephew, British subjects and inhabitants of Gibraltar.

I feel persuaded that these, as well as other authorities of the province, will do everything in their power to effect the release of the individuals in question, with the arrest of the robbers; but I greatly fear that, under the existing circumstances, their efforts are not likely to be successful, inasmuch as the robbers had, during the night of Saturday, more than ample time to reach a place of concealment, and would, in all probability, have selected for their purpose the very wild and rugged country situated on the left hand side of the road leading from the lower ford of the River Guadiaro to Estepona, where it would be a matter of extreme difficulty to discover their hiding-place.

No additional information on this subject has reached this place, but it may be presumed that by this time some communication relating to the ransom demanded by the robbers will have been received at Gibraltar, and it is to be hoped that the persons who may be intrusted with that part of the management of the case will be aware that it will have to be conducted with the utmost secresy, circumspection, and tact.

I have, &c.

(Signed) FRANCIS FRANCIA.

Inclosure 6 in No. 25.

Consul Mark to Mr. Layard.

Sir, *Malaga, May* 24, 1870.

I BEG to acknowledge receipt of your Excellency's telegram of this date. I immediately called on the Civil Governor, Don Manuel Somoza, who informed me had been in telegraphic communication with the Minister of the Interior, and exhibited the correspondence which had taken place. It appeared by its tenor, that he deprecated any military or ostensible measures that might impede the rescue of the captives, of whose position he appeared to be ignorant, for want of telegraphic communication with the neighbourhood of the place where the capture was effected, and from not being within the limits of his official jurisdiction, but that he had taken measures for their discovery and release.

I addressed to his Excellency the Civil Governor an official letter on the subject, copy of which I inclose, as also of the telegram transmitted subsequently to the personal interview alluded to, and I shall not fail to keep your Excellency informed of what takes respecting this unfortunate occurrence.

I have, &c.

(Signed) W. PENROSE MARK.

Inclosure 7 in No. 25.

Consul Mark to Señor Somoza.

(Translation.) *Malaga, May* 24, 1870.

I HAVE just received a telegraphic despatch from his Excellency Her Britannic Majesty's Minister at Madrid, relative to the deplorable occurrence which has taken place in the neighbourhood of San Roque, where two subjects of my nation—Messrs. Bonnell—have been seized and carried off by a band of brigands.

By his Excellency's desire I make application to your Excellency, requesting that you will be pleased to acquaint me with the measures adopted in order to procure the release of the captives. His Excellency also observes to me that the first and principal object to be borne in mind is the safety of the prisoners, and that no military or other steps should be taken which might place their lives in jeopardy.

I deem it superfluous to recommend this grave case to your particular attention, and I trust that you will be good enough to communicate to me any intelligence of

interest relative thereto, for the information of Her Britannic Majesty's Legation and Government.

God preserve, &c. (Signed) WM. PENROSE MARK,

No. 26.

Mr. Layard to the Earl of Clarendon.—(Received May 30.)

My Lord, *Madrid, May 27, 1870.*

I HAVE the honour to transmit herewith, for your Lordship's information, copy of a despatch and its inclosure from Mr. Consul Mark, with reference to the orders given by the Governor of Malaga to the Guardia Civil as to the line of conduct in attempting to secure the release of the Messrs. Bonnell.

I have, &c.
(Signed) A. H. LAYARD.

Inclosure 1 in No. 26.

Consul Mark to Mr. Layard.

Sir, *Malaga, May 25, 1870.*

I HAVE the honour to inform your Excellency that I this morning received an official answer to the letter I addressed to the Governor of Malaga with reference to the case of Messrs. Bonnell. Your Excellency will perceive, by the contents of the copy inclosed, that the Governor confirms the particulars transmitted in my telegram of yesterday. I have since called on the Governor, but he is not yet aware of the locality to which the robbers have resorted, and nothing new has transpired worthy of detailing. His orders along the coast-line stations of the Civil Guard are not to appear themselves, but to send confidential explorers, with instructions to negotiate the release of the Bonnells, if they should discover the place of their security.

I have, &c.
(Signed) WM. PENROSE MARK.

Inclosure 2 in No. 26.

Señor Somoza to Consul Mark.

(Translation.) *Malaga, May 24, 1870.*

I TAKE note of your communication of this day's date, informing me of the seizure of the British subjects, Messrs. Bonnell, in the vicinity of San Roque, and the desire manifested by his Excellency Her Britannic Majesty's Minister at Madrid that attention may be chiefly directed to the safety of the captives; and, in reply, I shall state to you that, upon the first intelligence of this lamentable event, appropriate orders were given to the chiefs of the line of Civil Guards, and forthwith the requisite prudence shall be observed, so as to effect the rescue without endangering the lives of the captives, as encharged by my Government, influenced by a vivid interest in the favourable result of said affair. I should furthermore assure you that the most effective measures are being adopted, in order to accomplish the liberation of the captives.

God preserve, &c. (Signed) EMML. SOMOZA.

No. 27.

Mr. Layard to the Earl of Clarendon.—(Received May 31.)

My Lord, *Madrid, May 28, 1870.*

YESTERDAY evening the Under-Secretary for Foreign Affairs communicated to me a telegram from the Governor of Cadiz, in which his Excellency informs the Minister of the Interior that he had just returned from Gibraltar, and that the family of Messrs. Bonnell had received no intelligence whatever concerning their captured relatives. His Excellency, however, states that he was confident that he had at his orders a person who should be able to give information concerning the captives, and that he hopes for

speedy results. Later, however, I received a telegram from Sir Richard Airey, in which he states that up to yesterday morning there was no intelligence nor trace of the Messrs. Bonnell.

I have, &c.
(Signed) A. H. LAYARD.

No. 28.

Mr. Layard to the Earl of Clarendon.—(*Received May* 31.)

My Lord, *Madrid, May* 28, 1870.

I HAVE the honour to inclose to your Lordship herewith copies of further correspondence on the subject of the late capture of the Messrs. Bonnell by Spanish brigands.

I have, &c.
(Signed) A. H. LAYARD.

Inclosure 1 in No. 28.

Sir R. Airey to Mr. Layard.

(Extract.) *Gibraltar, May* 25, 1870,

WITH reference to my despatch of 23rd instant, I have the honour to transmit to your Excellency a copy of a letter which I have received from the Governor of Algeciras.

I received your telegram in reply to mine, respecting the issue of a safe-conduct to Raphael Gabaron at 2·30 this morning, and the requisite instructions from the Spanish Government, reached the Spanish Consul here almost the same time.

The safe-conduct was immediately prepared, but as Gabaron was sleeping on board of a vessel in the bay, it was after 4 o'clock this morning before the Town Mayor saw him. He started, however, before daylight, with instructions to find out the retreat of the brigands, to negotiate with them for the ransom of the Messrs. Bonnell, and to return to Gibraltar with all possible expedition.

He received further messages from the Bonnell family, and a sum of money to defray his own expenses.

Inclosure 2 in No. 28.

Señor Servert to Sir R. Airey.

(Translation.)
Excellency,

IN reply to your communication of yesterday I have to inform you that, as soon as the disagreeable occurrence of the capture of Mr. John Bonnell and his nephew, inhabitants of Gibraltar, by five brigands, apparently Spaniards, became known, the said capture having been made at the place named Saval, in the district of the Gibraltar Lines, when those gentlemen were returning, in the evening of the 21st instant, from their usual ride, the most active and proper measures were taken for their release. The antecedents and circumstances known up to the present time causes it to be presumed that the criminals will be taken, and that I shall very soon have the satisfaction of being able to communicate that fact to your Excellency.

Your Military Secretary will already have informed your Excellency of the immediate measures taken for arriving at the desired result; and yesterday evening, after my interview with that gentleman, the Civil Guard and their Commander, abandoning their other duties, bent all their energies to that object, and will not rest in their endeavours to attain it.

Up to this time we know something of the description of the persons who committed the crime, and the name of one of them; and we have learned that they were armed and mounted, four of them on horses, and one on a mule, and that they carried off a horse belonging to the captives, and a mule belonging to one Don Antonio Herrera.

Your Excellency will be sure that nothing will afford me greater satisfaction than to

give you shortly good news concerning this matter, which has produced such a disagreeable effect upon me.

God preserve, &c. (Signed) J. N. SERVERT.

Inclosure 3 in No. 28.

Consul Reade to Mr. Layard.

Sir, *Cadiz, May* 26, 1870.

I HAVE the honour to acknowledge the receipt of your Excellency's despatch of the 24th instant, instructing me as to the language to be held in my communications with the local authorities, respecting the late capture by Spanish brigands of the Messrs. Bonnell, of Gibraltar, and directing me to report to the Governor of Gibraltar, as well as to your Excellency, any information I may obtain with reference to the captives.

From my former communications on the subject, your Excellency will have ere this learnt that the instructions now transmitted to me have, in some measure, been anticipated, and that the Governor of the province has removed to the immediate neighbourhood of the locality where the act of brigandage was perpetrated.

I need scarcely add I shall continue to act in this matter conformably with your Excellency's directions, and have transmitted corresponding instructions to Mr. Vice-Consul Francia, at San Roque, who will at the same time place himself in communication with the Governor of Gibraltar.

The brigands who, I believe, are known to originate from the district of Ronda, were traced in that direction as far as the River Guadiaro only a few hours after the occurrence of the "enlèvement," and have doubtlessly conveyed their prize to some hiding-place in the Sierra.

Beyond the knowledge of this information, the Governor did not up to the eve of his departure possess any clue whatever to the movements or whereabouts of the fugitives. As, however, money, is evidently the object of the brigands, he confidently relies on an early recovery of the captives by the payment of a ransom

I have, &c.

(Signed) T. F. READE.

No. 29.

Consul Reade to the Earl of Clarendon.—(*Received May* 31.)

My Lord, *Cadiz, May* 24, 1870.

I HAVE the honour to transmit to your Lordship herewith a copy of a despatch which I this day addressed to Her Majesty's Minister at Madrid, with reference to the capture by Spanish brigands of two British subjects resident at Gibraltar.

I have, &c.

(Signed) THOS. F. READE.

Inclosure in No. 29.

Consul Reade to Mr. Layard, May 24, 1870.

[See Inclosure in No. 23.]

No. 30.

Consul Reade to the Earl of Clarendon.—(*Received May* 31.)

My Lord, *Cadiz, May* 25, 1870.

I HAVE the honour to transmit herewith the inclosed copy of a communication from this Office to Her Majesty's Minister at Madrid, informing his Excellency that the Civil Governor of this district has proceeded to the neighbourhood of the locality where the Messrs. Bonnell, of Gibraltar, were seized and carried off by Spanish brigands.

I have, &c.

(Signed) THOS. F. READE.

Inclosure in No. 30.

Consul Reade to Mr. Layard.

Sir, *Cadiz, May* 25, 1870.

WITH reference to my despatch of yesterday, I have the honour to inform your Excellency that, at an early hour this morning, the Civil Governor of this Province embarked on board the steam-vessel "Algeria" and proceeded in her to the Spanish lines, Gibraltar.

I have, &c.
(Signed) THOS. F. READE.

No. 31.

Mr. Herbert to Mr. Hammond.—(*Received May* 31.)

Sir, *Downing Street, May* 31, 1870.

REFERRING to previous correspondence I am directed by Earl Granville to transmit to you, for the information of the Earl of Clarendon, copies of three despatches, with inclosures, from the Governor of Gibraltar, giving further particulars connected with the events, already reported by telegrams, attending the capture of British subjects by Spanish brigands, and the steps taken to attempt their release.

I am, &c.
(Signed) ROBERT G. W. HERBERT.

Inclosure 1 in No. 31.

Sir R. Airey to Earl Granville.

My Lord, *Gibraltar, May* 22, 1870.

I AVAIL myself of the earliest opportunity to transmit by the packet, hourly expected, a copy of a telegram which I had the honour of addressing to your Lordship, reporting the capture of Mr. John Bonnell and his nephew Mr. John Anthony Bonnell, British subjects and merchants of Gibraltar, by a party of Spanish brigands yesterday evening about four miles from Gibraltar, in Spanish territory, on their return from their usual ride.

I also beg to transmit to your Lordship a copy of a communication which I received this morning from Mr. Varese, of this city, and upon the receipt of which I lost no time in placing myself in communication with Mr. Layard, Her Majesty's Minister at Madrid, and with the Governor of Algeciras, the Military Commandant of the Spanish lines, and Mr. Francis Francia, Her Majesty's Vice-Consul at San Roque, with a view to insure the safety and obtain the speedy release of the captives.

I shall not fail to communicate to your Lordship forthwith the result of my representations to the Spanish authorities, and I would call your Lordship's special attention to the concluding of Mr. Varese's communication that a body of the Guardia Civil in charge of Sergeant Molina left the Spanish lines early this morning in pursuit of the brigands.

I earnestly trust the pursuit of the brigands may be conducted with due caution and without endangering the safety of the captives, who, and their friends, are willing to submit to the payment of any reasonable sum that may be demanded for their ransom.

I have, &c.
(Signed) RICHARD AIREY.

Inclosure 2 in No. 31.

Telegram from Sir R. Airey to Earl Granville, May 22, 1870.

[See No. 1.]

Inclosure 3 in No. 31.

Deposition of Joseph Varese.

[See Inclosure 5 in No. 22.]

Inclosure 4 in No. 31.

Sir R. Airey to the Governor of Algeciras.

Sir, *Gibraltar, May* 22, 1870.

I HAVE the honour to transmit the accompanying copy of a communication which has been submitted to me by Mr. J. Varese, representing that yesterday evening Mr. John Bonnell and his nephew on their return from their usual ride on the eastern beach, in Spanish territory, were captured by apparently Spanish brigands, and have not since been heard of.

The gentlemen are British subjects of great respectability, possessing property in Gibraltar.

I have the honour to request that you will be so good as to acquaint me if any and what steps have been or are proposed to be taken for the immediate release of these gentlemen, and the seizure of the persons implicated in this extraordinary outrage.

I have, &c.

(Signed) RICHARD AIREY.

Inclosure 5 in No. 31.

Governor Sir R. Airey to Earl Granville.

My Lord, *Gibraltar, May* 23, 1870.

WITH reference to my despatch of yesterday, forwarding to your Lordship by the packet which left for Southampton early this morning, and to my telegrams dated yesterday and to-day relating to the capture of Mr. Bonnell and his nephew by a party of Spanish brigands, I have the honour to transmit to your Lordship copies of two communications which I have received from the Commandant of the Spanish lines, also copies of a note and an official letter from Mr. Francis Francia, Her Majesty's Vice-Consul at San Roque, regarding this unfortunate occurrence.

From the correspondence your Lordship will perceive that the Spanish authorities have been most prompt in the steps they have taken, and they are doing all in their power for the liberation of the captives and the discovery of the retreat of the brigands.

I regret to say that up to the present moment their efforts have been unsuccessful, and no communication whatever has yet been received at Gibraltar relating to the ransom, which it was expected the brigands would ere this have demanded for the liberation of the captives.

I have, &c.

(Signed) RICHARD AIREY.

Inclosure 6 in No. 31.

Telegram from Sir R. Airey to Earl Granville, May 23, 1870.

[See Inclosure in No. 10.]

Inclosure 7 in No. 31.

Señor Gatrid to Sir R. Airey, May 22, 1870.

[See Inclosure 2 in No. 25.]

Inclosure 8 in No. 31.

Señor Gatrid to Sir R. Airey, May 23, 1870.

[See Inclosure 3 in No. 25.]

Inclosure 9 in No. 31.

Vice-Consul Francia to Sir R. Airey, May 22, 1870.

[See Inclosure 4 in No. 25.]

Inclosure 10 in No. 31.

Vice-Consul Francia to Sir R. Airey, May 23, 1870.

[See Inclosure 5 in No. 25.]

Inclosure 11 in No. 31.

Sir R. Airey to Earl Granville.

My Lord, *Gibraltar, May* 24, 1870.

I HAVE the honour to acknowledge the receipt of your Lordship's telegram of yesterday, and have communicated to the Governor of Algeciras the Earl of Clarendon's earnest request to the Spanish Government, through Mr. Layard, not to pursue the brigands until the captives are released.

In continuation of my despatch transmitted to your Lordship yesterday, viâ Spain, and with reference to my telegram of this day's date, I have to acquaint your Lordship that I was informed this morning that three Spaniards now in Gibraltar, on temporary permits, have expressed their willingness to proceed into Spain and endeavour to effect the release of the captives. One of them, however, named Gabaron, being politically compromised, refuses to go without a safe-conduct from the Spanish Government, and the other two will not go without him.

An application was made to the Spanish Consul for a safe-conduct, but that officer having personally informed me that it was not in his power to grant it without instructions from the Spanish Government, I at once telegraphed to Mr. Layard to urge the Spanish Government to grant the necessary authority. I trust that through Mr. Layard's good offices the difficulty will be speedily overcome, and that I shall soon be in a position to report to your Lordship the departure of the three individuals on their delicate and important mission.

I have, &c.
(Signed) RICHARD AIREY.

P.S.—I beg to inclose a copy of a letter from the Governor of Algeciras, dated 23rd instant, informing me of the steps taken by him for the liberation of the captives.

R. A.

Inclosure 12 in No. 31.

Señor Servert to Sir R. Airey, May 23, 1870.

[See Inclosure 2 in No. 28.]

No. 32.

Mr. Herbert to Mr. Hammond.—(*Received June* 1.)

Sir, *Downing Street, June* 1, 1870.

WITH reference to my letter of yesterday, I am directed by Earl Granville to transmit to you, for the information of the Earl of Clarendon, a copy of a despatch from the Governor of Gibraltar, reporting the departure of Raphael Gabaron from Gibraltar to endeavour to obtain the release of Messrs. Bonnell from the Spanish brigands.

I am, &c.
(Signed) ROBERT G. W. HERBERT.

Inclosure 1 in No. 32.

Sir R. Airey to Earl Granville.

My Lord, *Gibraltar, May* 25, 1870.

WITH reference to my telegram, a copy of which is herewith inclosed, and my despatch of yesterday's date, I have the honour to inform your Lordship that I received a telegram from Mr. Layard at 2·30 this morning, informing me that the Spanish Government had sent instructions to the Spanish Consul here to come to an understanding with me, and give a safe-conduct to Raphael Gabaron if necessary.

A telegram from the Spanish Government in a like sense reached the Spanish Consul about the same time, and no time was lost in making all the necessary arrangements for the immediate departure of Gabaron on his important errand.

He started at daybreak this morning, with instructions to find out the retreat of the brigands, to arrange with them for the ransom of the captives, and to return with all possible expedition to Gibraltar.

He also received instructions from the Bonnell family, and a sufficient sum of money to meet his expenses.

I have, &c.
(Signed) RICHARD AIREY.

Inclosure 2 in No. 32.

Telegram from Sir R. Airey to Earl Granville, May 26, 1870.

[See No. 15.]

No. 33.

Mr. Layard to the Earl of Clarendon.—(Received June 2.)

My Lord, *Madrid, May* 30, 1870.

I HAVE the honour to transmit herewith, for your Lordship's information, copies of further correspondence upon the subject of the capture of the Messrs. Bonnell by Spanish brigands.

I have, &c.,
(Signed) A. H. LAYARD.

Inclosure 1 in No. 33.

Sir R. Airey to Mr. Layard.

Sir, *Gibraltar, May* 26, 1870, 5·30 P.M.

I HAVE the honour to acknowledge the receipt of your Excellency's letter dated 23rd instant, the morning after the arrival at Madrid of my first telegram, regarding the capture of the Messrs. Bonnell, British subjects, and residents at Gibraltar, by Spanish brigands, on Spanish territory, on the evening of the 21st instant.

I beg to be permitted to express my thanks for your Excellency's valuable exertions on this occasion, and for the active measures immediately and at once adopted by the Spanish Government, with the further assurance that no exertions nor expense would be spared to effect the safe release of the captives.

I regret to say that until this moment no positive trace has been arrived at with regard to the parties implicated.

A glance at the map of Andalusia will show the Sierra of Vermeja, running south-east and north-west to Monte of Ronda, a country rugged and inaccessible in itself, and intersected by deep rocky ravines towards the sea. It is supposed that the brigands, after crossing the Guadiaro River, have proceeded with their captives to the neighbourhood of Maniloa and north of Estepona, where a precipitous country with numerous caves facilitates concealment.

Within the last few days, several emissaries of notoriety, as being acquainted with the contrabandists, and perhaps with the brigands themselves, have been dispatched to

that locality, in order to arrange terms for the safe liberation of the captives, which I have some reason to hope, from hearsay of their friends, may be effected.

The Governor of Cadiz arrived last evening at San Roque, and sent me a message to say that he would come into Gibraltar, but I have not yet seen him.

I have, &c.
(Signed) RICHARD AIREY.

Inclosure 2 in No. 33.

Consul Mark to Mr. Layard.

Sir, *Malaga, May* 27, 1870.

I HAVE the honour to acknowledge the receipt of your Excellency's despatch of the 24th instant, confirmatory of your telegram of the same day, relative to the distressing case of the Messrs. Bonnell.

I considered it my duty to transcribe to the Governor of this province a translated copy of the above cited despatch, which I placed in his hands yesterday.

It is with regret that I report to your Excellency that up to this evening no intelligence or clue has been obtained in this quarter which might lead to the discovery of the brigands or their captives. Doubts are now entertained as to their having entered the territory of this province. The place of the seizure is in the Province of Cadiz; and it is not improbable that, instead of making for the Serrania de Ronda, they may have taken an opposite direction, with the object of baffling their pursuers. The Governor has telegraphed to the Spanish Consul at Gibraltar to transmit to his Excellency any intelligence that may be elicited through his agency. As soon as anything of interest becomes known here, I shall telegraph it to your Excellency without a moment's delay.

I have, &c.
(Signed) WM. PENROSE MARK.

Inclosure 3 in No. 33.

Sir R. Airey to Mr. Layard.

Sir, *Gibraltar, May* 27, 1870.

I HAVE the honour to acknowledge the receipt last night of your Excellency's letter dated 24th instant, with reference to the capture of the Messrs. Bonnell by Spanish brigands on the 21st instant, and requesting to be furnished with all further information which can be obtained on this, as well as on other points, in order that your Excellency may make such communications as may be necessary to the Spanish Government.

I am in hopes that my telegrams up to 25th instant will have kept your Excellency informed of all material points, since which time nothing has transpired, and no information or trace of the brigands has been discovered.

Subsequently to the sending off of my despatch dated yesterday evening, I received a visit from the Governor of Cadiz, who had already been at San Roque, and who assured me that no means had been left untried to insure the safety of the captives and for their speedy release, and that the most explicit instructions had been given to suspend all pursuit of the brigands until the captives had been released, and, in fact, that no steps should be taken which might endanger their lives.

It appears that the Messrs. Bonnell, the younger of whom possesses considerable property, were in the habit of riding out every afternoon and stopping at a farm-house called the "Ventorrillo de Sabal," on the eastern beach, under a high rocky hill called the "Queen of Spain's Chair," about four miles from Gibraltar.

It appears that a party of five men had been hanging about San Roque, and had come into Gibraltar, and there seems to be no doubt that these people, who are now known to be a band from Malaga, possibly in connection with some person or persons in Gibraltar, made themselves acquainted with the circumstances and habits of the Messrs. Bonnell, and that their seizure was the result of an organized plan.

The eldest Mr. Bonnell, the uncle, is an infirm paralyzed man, who can scarcely walk, although he can sit on horseback, and used to take daily rides, always accompanied by his nephew, a young man of delicate constitution, and supposed to be incapable of much fatigue.

The general feeling here is that one or other of these men will be able to proceed to the place of concealment of the brigands, who, I believe, are personally known to them,

and as they have been instructed to guarantee such amount of ransom as may be demanded by the brigands, fair hopes may be entertained of their safe liberation.

I have, &c.
(Signed) RICHARD AIREY.

No. 34.

Mr. Layard to the Earl of Clarendon.—(Received June 3.)

My Lord, *Madrid, May 31, 1870.*

I HAVE the honour to inclose for your Lordship's information translations of three telegrams which were communicated to me yesterday by Señor de Blas, the Under-Secretary of State for Foreign Affairs. It would appear from them that although the hiding-place of the brigands had not yet been discovered, the Spanish authorities were on their track, and had reason to believe that they would soon be able to effect the release of the captives. As Señor de Blas had expressed to me an opinion that it would be advisable not to make any further offers of money from Gibraltar to the brigands, which would only have the effect of raising their demands and rendering the liberation of the prisoners more difficult, I have telegraphed Señor de Blas's opinion to Sir Richard Airey.

I have, &c.
(Signed) A. H. LAYARD.

P.S.—Since writing the above I have received from Sir Richard Airey the following telegram:—"Let all remain quite quiet for the present; no pursuit, no molestation."

Inclosure in No. 34.

Telegrams received by the Minister of the Interior.

(Translation.)

(No. 1.)

The Governor to the Minister of the Interior.

Malaga, May 30, 1870, 11 A.M.

RECEIVED this morning last night's telegram. No news of emissaries, which is not to be wondered at, owing to difficulty of communicating. The person who promises to obtain release has just left here; but the publicity given to the great offers made from Gibraltar excites cupidity and impedes success. Before making the "coup," they were in the inn "La Palma," at San Roque, and then went to the tavern called "Sabal," close to the lines; they are young. I am in possession of a description of the men and of their horses, and will not lose the trace. I am in want of funds.

(No. 2.)

The Governor's Secretary to the Minister of the Interior.

Cadiz, May 29, 1870, 12·45 midnight.

Governor remains at San Roque. I have sent him your Excellency's telegram, which he will not receive before to-morrow, after 7 A.M., as there is no communication with that place before then.

(No. 3.)

San Roque, May 30, 1870, 8·30 A.M.

Received your Excellency's last night's telegram sent to the capital (Cadiz). The steps taken for the release of the captives are being unremittingly pursued. There are grounds for supposing that they will have a speedy and favourable result. Your Excellency may rest assured that I will spare no efforts to arrive at the end desired by your Excellency.

No. 35.

Mr. Layard to the Earl of Clarendon.—(*Received June* 4.)

My Lord, *Madrid, June* 1, 1870.

SENOR DE BLAS communicated to me yesterday evening a telegram from the Governor of Malaga, stating that his Excellency had been informed from Ronda that it was confidently believed that within a very short time the Messrs. Bonnell would be released. At night, I received a telegram from Sir Richard Airey, confirming this information in these words:—"An emissary from Malaga writes, 'buenas noticias, mucho silencio,' so all remains quiet for the present."

I have every hope, therefore, that I shall soon be able to inform your Lordship that the captives have been released.

I am, &c.

(Signed) A. H. LAYARD.

No. 36.

Mr. Layard to the Earl of Clarendon.—(*Received June* 4, 1.30 P.M.)

(Telegraphic.) *Madrid, June* 4, 1870.

MINISTER of Interior informs me that Messrs. Bonnell are released and are gone to Gibraltar with the Governor of Gibraltar.

No. 37.

Mr. Layard to the Earl of Clarendon.—(*Received June* 5.)

(Telegraphic.) *Madrid, June* 4, 1870, 2·8 P.M.

THE Governor of Gibraltar telegraphs to me that only the elder Bonnell is arrived to arrange ransom.

No. 38.

Sir R. Airey to the Earl of Clarendon.—(*Received June* 5.)

(Telegraphic.) *San Roque, June* 4, 1870, 4·25 P.M.

MR. BONNELL, the uncle, arrived at Gibraltar this morning to arrange ransom. Come by steamer from Cadiz. Inaction and secrecy still necessary.

No. 39.

Mr. Layard to the Earl of Clarendon.—(*Received June* 6.)

My Lord, *Madrid, June* 3, 1870.

I HAVE the honour to inclose, for your Lordship's information, translation of a telegram from the Governor of Cadiz to the Minister of the Interior, which was commu-

nicated to me by Señor de Blas yesterday afternoon, and copy of a telegram from the Governor of Gibraltar, which I received late in the evening.

Under the circumstances mentioned in those telegrams there is nothing to be done here but to remain perfectly quiet.

Señor de Blas informed me yesterday that a Council of the Ministers was held with regard to the Messrs. Bonnell, and that Señor Rivero, the Minister of the Interior, was authorized to expend the sums necessary for the release of those gentlemen. He said that the expenses would be very considerable, but that the Spanish Government were determined to vindicate the honour of the country, and that when the captives were once safe they would take measures to punish the criminals in this affair and to prevent the recurrence of such an outrage, which, there was reason to hope, would be effective.

I have, &c.
(Signed) A. H. LAYARD.

Inclosure in No. 39.

The Governor of Cadiz to the Minister of the Interior.

(Translation.)
(Telegraphic.) *San Roque, June* 2, 1870.

OUR hopes are increased of obtaining a speedy and favourable result to he steps taken for the rescue of the Messrs. Bonnell. I ask your Excellency's advice whether I ought to return to Cadiz, where other business calls me.

No. 40.

Sir F. Rogers to Mr. Hammond.—(Received June 7.)

Sir, *Downing Street, June 7, 1870.*

WITH reference to previous correspondence I am directed by Earl Granville to transmit to you, for the information of the Earl of Clarendon, copies of two further telegrams from the Governor of Gibraltar, relative to the progress of the negotiations for the release of the Messrs. Bonnell.

I am, &c.
(Signed) FREDERIC ROGERS.

Inclosure 1 in No. 40.

Sir R. Airey to Earl Granville.

(Telegraphic.) *San Roque, June* 6, 1870, 5·7 P.M.

I HAVE just received the following telegram dated Cadiz, June 6, 2·25 P.M.:—

"Delivering cash to Chief. Captive will arrive here by to-night.—RECANO."

Inclosure 2 in No. 40.

Sir R. Airey to Earl Granville.

(Telegraphic.) *San Roque, June* 6, 1870, 3·23 P.M.

THE following telegram has just been communicated to me from Cadiz, June 6, 8·34 P.M.:—

"To Gibraltar Post Office: Manuel Montegriffo.

"Affair marching exceedingly well. John had interview Chief. Expect we shall all get there to-morrow night. Inform his Excellency and the family."

No. 41.

Mr. Layard to the Earl of Clarendon.—(*Received June* 7, 10·30 P.M.)

(Telegraphic.) *Madrid, June* 7, 1870, 7·35 P.M.

THE Secretary of the Governor of Cadiz telegraphs to the Minister of the Interior that the second Mr. Bonnell is arrived at Puerto de Santa Maria; both are now, consequently, released.

No. 42.

Mr. Layard to the Earl of Clarendon.—(*Received June* 8.)

My Lord, *Madrid, June* 4, 1870.

SENOR RIVERO, the Minister of the Interior, has sent me his Secretary with a telegram from the Governor of Cadiz, stating that he has just heard that the Messrs. Bonnell have arrived at Gibraltar, and that he is himself going to that place.

I have, &c.

(Signed) A. H. LAYARD.

No. 43.

Mr. Layard to the Earl of Clarendon.—(*Received June* 8.)

My Lord, *Madrid, June* 4, 1870.

HIS Highness the Regent has just sent one of his aides-de-camp to me to inform me that the Messrs. Bonnell have been released, and to express to me, on his Highness's behalf, the very great pleasure and satisfaction which he has experienced on receiving this information.

I may avail myself of this opportunity to state to your Lordship that his Highness has on several occasions expressed to me personally the great pain and regret which he has felt at the outrage upon subjects of Her Majesty, and his deep sympathy with the captives and their families.

I have, &c.

(Signed) A. H. LAYARD

No. 44.

Mr. Layard to the Earl of Clarendon.—(*Received June* 8.)

My Lord, *Madrid, June* 5, 1870.

AS I had the honour of informing your Lordship in my despatches of yesterday, the Regent sent an aide-de-camp, and the Minister of the Interior a Secretary, to inform me that the Messrs. Bonnell had been released, and had reached Gibraltar. Fully relying on this information, which there was no reason to question, I telegraphed it at once to your Lordship. It was not till 8 o'clock in the evening that I received a telegram from Sir Richard Airey, informing me that only one of the Messrs. Bonnell, the uncle, had arrived in Gibraltar in order to arrange for the payment of the ransom required by the brigands, who still retained his nephew. Sir Richard Airey again urged "inaction and secrecy."

I lost no time in telegraphing to your Lordship, and in communicating with Señor de Blas, who was inclined to maintain the accuracy of the report of the Governor of Cadiz. Late at night, however, I received letters from him, and from the Minister of the Interior, confirming the information sent by Sir Richard Airey, and inclosing several telegrams to and from the Governor of Cadiz (copies of which are inclosed for your Lordship's information), explaining the misunderstanding which had arisen, and which is to be attributed, it would appear, to the zeal of the Governor of Cadiz.

The Regent, whom I had an opportunity of seeing last night, expressed to me his regret at what had occurred, and assured me that the most positive injunctions had again been sent to the authorities to abstain from any steps which might endanger the safety of the Messrs. Bonnell.

I have this morning received a copy from the Minister of the Interior of a further telegram from the Governor of Cadiz, which states that the elder Mr. Bonnell has already left Gibraltar with the money required for the release of his nephew, and which amounts, it is stated, to 22,000 duros, or nearly 4,500*l.*

I have, &c.
(Signed) A. H. LAYARD.

Inclosure in No. 44.

Telegrams between the Minister of the Interior and the Governor of Cadiz.

(Translations.)

(No. 1.)

The Governor of Cadiz to the Minister of the Interior.

San Roque, June 4, 1870.

I HAVE just heard that the Messrs. Bonnell have arrived at Gibraltar. I am leaving for that place.

(No. 2.)

Sir R. Airey to Mr. Layard.

San Roque, June 4, 1870, 6·14 P.M.

Mr. Bonnell, the uncle, arrived at Gibraltar this morning to arrange ransom. Came by steamer from Cadiz. Inaction and secrecy still necessary.

(No. 3.)

The Governor of Cadiz to the Minister of the Interior.

San Roque, June 4, 1870.

At the moment of leaving for Gibraltar I hear that Mr. John Bonnell, the elder of the two captives, has arrived in that place to get 22,000 duros, the amount of ransom. The other remains as a hostage. Your Excellency may consider this information as official.

(No. 4.)

The Minister of the Interior to the Governor of Cadiz, at San Roque.

Madrid, June 4, 1870.

I call your attention to your despatch of 12·15 of to-day. You should consider that I have communicated that despatch to every one, on the information sent by you. I could not believe that you could have communicated to me information of so much importance, without the most complete certainty. I hasten to tell you, without, however, having yet communicated with the Council of Ministers, that before exposing to any risk the life of the captive, the Government will provide the 22,000 duros, which will be delivered to the Ambassador here. Do not lose a moment.

(No. 5.)

The Spanish Consul to the Minister of State.

San Roque, June 4, 1870, 3·55 P.M.

The elder of the captives Bonnell has arrived. The ransom is being prepared for the other, who is well and carefully concealed. The greatest secrecy is necessary in order not to jeopardise his life.

(No. 6.)

The Minister of the Interior to the Governor of Cadiz, at San Roque.

Madrid, June 4, 1370, 11·20 P.M.

I am in despair. Tell me if the two Messrs. Bonnell are in Gibraltar.

(No. 7.)

The Governor of Cadiz to the Minister of the Interior.

Let your Excellency discard all fear. The elder Mr. Bonnell has already left with the amount of the ransom in order to release his nephew. He has passed the whole day in Gibraltar arranging this affair.

(No. 8.)

The Minister of the Interior to the Governor of Cadiz.

Keep me informed. I thought that the two Bonnells were in Gibraltar, and I communicated it to every one. Let the news of the two come as soon as possible, in order to avoid the very bad effect of this error.

(No. 9.)

The Governor of Cadiz to the Minister of the Interior.

The mistake arose from the English authorities at Gibraltar, and my impatience to communicate to your Excellency the news led me into error. Let your Excellency be assured that the release of the younger Bonnell is certain, and in any case the Governor of Gibraltar can tell his Government how much has been done and is still doing for the captives.

(No. 10.)

The Minister of the Interior to the Governor of Cadiz.

Keep me well informed.

No. 45.

Consul Reade to the Earl of Clarendon.—(Received June 8, 6·5 A.M.)

(Telegraphic.) *Cadiz, June* 7, 1870, 1·25 P.M.

RANSOM paid and remaining captive liberated. The two Bonnells proceeded to Gibraltar in "Trinculo."

No. 46.

Sir R. Airey to the Earl of Clarendon.—(Received June 8, 6·7 A.M.)

(Telegraphic.) *Gibraltar, June* 7, 1870, 5 P.M.

I HAVE the satisfaction to report the receipt of the following telegram addressed to me by Mr. Recano, dated Cadiz, June 7, 10·45 A.M.:—"Captive released."

No. 47.

Mr. Layard to the Earl of Clarendon.—(*Received June* 8, 6 P.M.)

(Telegraphic.) *Madrid, June* 8, 1870.

THE brigands who captured the Bonnells were waylaid on their return from Puerto Santa Maria, and three out of the four killed by the Spanish Guardia Civil. The fourth will, it is expected, be taken. Ransom recovered, I understand.

No. 48.

Mr. Herbert to Mr. Hammond.—(*Received June* 8.)

Sir, *Downing Street, June* 8, 1870.

I AM directed by Earl Granville to acquaint you, for the information of the Earl of Clarendon, that the following telegram has just been received from the Governor of Gibraltar relative to the captives in Spain :—" Wednesday, 10 A.M. Messrs. Bonnell arrived here last night in gun-boat 'Trinculo,' perfectly well."

I am, &c.

(Signed) ROBERT G. W. HERBERT.

No. 49.

*Mr. Hammond to Mr. Herbert.**

Sir, *Foreign Office, June* 8, 1870.

I AM directed by Earl Clarendon to acquaint you, for the information of Earl Granville, that, in a telegram dated yesterday, Mr. Layard reports that two English officers had been fired at the previous evening near Gibraltar, but the parties who attacked them were captured; and that the Spanish Government were determined to take the severest measures to clear the country of such malefactors.

I am, &c.

(Signed) E. HAMMOND.

No. 50.

Mr. Herbert to Mr. Hammond.—(*Received June* 8.)

Sir, *Downing Street, June* 8, 1870.

I AM directed by Earl Clarendon to transmit to you, for the information of the Earl of Clarendon, a copy of a telegram from the Governor of Gibraltar, announcing the release of the English captives in the south of Spain.

I am, &c.

(Signed) ROBERT G. W. HERBERT.

Inclosure in No. 50.

Sir R. Airey to Earl Granville.

(Telegraphic.) *Gibraltar, June* 7, 1870, 5 P.M.

HAVE the satisfaction to report the receipt of the following addressed to me by M. Recano, dated Cadiz, June 7, 10·45 A.M. :—" Captive released."

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* A similar letter was addressed to the War Office.

No. 51.

Mr. Layard to the Earl of Clarendon.—(*Received June* 9.)

My Lord, *Madrid, June* 6, 1870.

I HAVE the honour to inclose for your Lordship's information copy of a despatch and its inclosures, which I have received this morning from the Governor of Gibraltar. I beg to call your Lordship's attention to the statement made by John Remos, one of the emissaries sent in search of the captives, that their liberation "is a mere question of money, in which there is complicity at Gibraltar."

I have, &c.
(Signed) A. H. LAYARD.

Inclosure 1 in No. 51.

Sir R. Airey to Mr. Layard.

Sir, *Gibraltar, June* 3, 1870.

I HAD the honour last night to receive your Excellency's letter, dated 31st ultimo, transmitting to me the copies of three telegrams, which your Excellency had received from the Minister of Foreign Affairs, dated as per margin.

On the 31st ultimo, I addressed a telegram to your Excellency, to the following effect: "An emissary from Malaga writes, 'Buenas noticias, mucho silencio;' so all remains quiet for the present."

On the 1st instant I transmitted the following telegram :—"I have a telegram from Malaga, stating, 'Mejor noticias, silencio;' no offer of money has been made from here."

On the 2nd instant I transmitted the following telegram : "Accounts from emissary near Malaga still hopeful and promising; captives well, and well cared for. Question only of time and money."

To-day I have transmitted a telegram dated Malaga, 2nd instant, stating merely, "Buenas noticias."

I have the honour to acquaint your Excellency that I am in daily communication with the Governor of Cadiz, who is now residing at San Roque, and am made fully acquainted with such measures as he may adopt with regard to the liberation of the Messrs. Bonnell, at the hands of the brigands, but which are confined to repressing any action on the part of the troops or Guardia Civil towards the brigands.

With reference to the information conveyed to me by your Excellency, that Señor de Blas had stated that it was the opinion at Madrid that no further offers of ransom should be made from Gibraltar, I have the honour to explain, with reference to my remark in the telegram above alluded to, dated June 1, that no authorized offer o any ransom has been officially made, although the relations of the Messrs. Bonnell did in the first instance of their own accord, privately instruct the emissary sent to negotiate for ransom, without specifying any sum.

In my opinion, and I am supported by that of persons here who have had experience in such matters, that it is more judicious to wait for overtures from the parties implicated.

In the meantime, this morning, the accompanying copy of a letter from the emissary at Malaga, received by a friend of the Bonnell family, was put into my hands, which I have the honour to transmit for your information; and I likewise transmit the translation (the original having been sent to the Governor of Cadiz at San Roque, and not yet returned) of a letter from the same individual at Malaga, dated 31st ultimo.

I have, &c.
(Signed) RICHARD AIREY.

Inclosure 2 in No. 51.

Señor Ramos to Señor Montegriffo.

(Translation.)

Don Manuel Montegriffo, *Malaga, May* 31, 1870.

THE object of this is to tell you that Providence led me on the 28th instant to go and dine at a place where I met a person also dining who recognized me so much so that I discovered myself to him, and through this friend I have discovered everything.

You may, therefore, tell the family of Don Juan that they are well, and taken good care of.

They were going to keep them for, at least, one month without letting one know anything about them until everything was quiet. They will soon bring me writings from both of them for the satisfaction of their family, and to satisfy them that they are alive.

It is a mere question of money, and in which there is complicity in Gibraltar, for they are decent (respectable) robbers, and I had the pleasure of seeing two of them last night. I tried to come to terms with them, and they answered that they would arrange matters with Don Juan, and bring to me them (*i.e.*, the captives), order for the money, and where I am to take it, holding myself responsible for everything by my life and that of the captives. I recommend you the utmost silence, because so it behoves me and every one else, for they are bad people.

Don Manuel, you will soon see me there (Gibraltar), don't ask me for further particulars, because I cannot give them, and these people don't wish them noised about. Don Manuel, this letter is dictated by one of them, you can, therefore, recall the other emissaries who have gone out, because I may say that I have them—the captives—delivered.

Should any one ask any questions always answer the same as before, that nothing is known, because you know full well what gossips the people in Gibraltar are. If anything can be done about the Guardia Civil, to do it.

I wrote you another letter on the 30th instant. Tell Señor Ruano to let my wife know that I am well.

(Signed) JUAN RAMOS.

Inclosure 3 in No. 51.

Señor Ramos to Señor Recano.

(Translation.)

Señor Don Antonio Recano, *Malaga, June* 1, 1870.

THE object of the present is to let you know that the matter is well arranged, and the individual with whom we are treating charges me to say that he knows that the Governor of Cadiz is in San Roque, and that he should go away, for his presence there may be of injury to the captives, and as regards myself he says that I must stay quiet, that he [several words illegible, but the sense apparently is] will let me know when he will give me the orders (for money), signed by Don Juan and his nephew, for it is at night that I have an interview with this individual, and at the same time I see others who are always telling me to have no care, that I shall take them to Gibraltar [the rest of the paragraph unintelligible].

Yesterday, the 31st, he sent for me, took me by the hand and said, what you cannot succeed in doing, not even the Governor of the province can succeed in doing; and he said, "You shall carry them off; but tell them at Gibraltar, Much silence." You may imagine all that I do not say to you, for until I see you we must be very patient as long as they wish, and they further charge me to say that the captives are in good health and well cared for.

Yesterday at 3 P.M. they asked me for the horse, which has not appeared so far.

Don Antonio, at 10 I received your letter by post, and I am sending two to Montegriffo. These people are driving me mad, I see that they are in company with some from other places, and that there are amongst them persons of [word illegible] and of utility, and the robbers give these affairs into their charge, for they have accomplices in Cordova, Antequera, and Granada, according to some words I caught; finally, I much desire silence, and then we shall see what will happen.

Be so good as to point out that my money came to an end this morning, for these are affairs in which it is necessary to spend money, and I should be grateful if the family would send me what they choose, and say that if I had not had hopes of succeeding I would have left already, and that this is an indispensable expense, and one always before them.

No more for the present, good-bye, &c.

(Signed) JOSE RAMOS.

P.S.—Don Antonio, let my wife know privately that I am well, for I do not want to write to San Roque.

No. 52.

Consul Reade to the Earl of Clarendon.—(Received June 9.)

(Telegraphic.) *Cadiz, June 8, 1870.*

THREE of the brigands who kidnapped the Bonnells were shot near Seville last night; the other two are tracked or surrounded.

No. 53.

The Earl of Clarendon to Mr. Layard.

Sir, *Foreign Office, June 9, 1870.*

THE Messrs. Bonnell having been released from the durance in which they have been held by the brigands, and the greater part of their captors having been overtaken and slain, it only remains for me to express to you the entire approval of Her Majesty's Government of the exertions which you have made in behalf of the captives, and to instruct you to convey to the Spanish Government the warm acknowledgments of that of Her Majesty for the promptitude and earnestness of the measures taken by them to obtain the release of the British captives.

I am, &c.
(Signed) CLARENDON.

No. 54.

Mr. Hammond to Sir F. Rogers.

Sir, *Foreign Office, June 9, 1870.*

MESSRS. BONNELL having been released from the hands of the brigands, most of whom have been subsequently overtaken and slain by the Spanish Civil Force, it appears to the Earl of Clarendon very desirable that the most searching investigation should be made at Gibraltar into all the circumstances of the case, which would seem to have been of a very peculiar character.

There appears to be a general impression that the brigands were on intimate terms with persons residing within the fortress, if not with the Messrs. Bonnell themselves, and that the case was not a mere act of brigandage, but was more or less connected with the system of contraband trade which so notoriously prevails at Gibraltar.

I am, therefore, to request that you will move Earl Granville to instruct the Lieutenant-Governor of Gibraltar to employ the utmost diligence in obtaining for Her Majesty's Government a complete account of all matters connected with the transaction, or bearing directly or indirectly upon it; and it is the more important that the inquiry should be fully and promptly carried out, inasmuch as there is good reason to believe that a representation will be speedily made by the Spanish Government against the state of things at Gibraltar, which imposes upon Spain constant expenditure, and which renders the maintenance of good relations between England and that country at all times precarious.

I am, &c.
(Signed) E. HAMMOND.

No. 55.

Mr. Layard to the Earl of Clarendon.—(Received June 10.)

My Lord, *Madrid, June 7, 1870.*

I HAVE the honour to inclose, for your Lordship's information, a translation of telegrams received yesterday with regard to the Messrs. Bonnell. Up to the time

the departure of the mail no news has been received of the arrival of the younger Mr. Bonnell at Cadiz.

I have, &c.
(Signed) A. H. LAYARD.

P.S., 3 *o'clock*.—I have this instant received the telegram announcing the release of the other Mr. Bonnell.

A. H. L.

Inclosure 1 in No. 55.

Sir R. Airey to Mr. Layard.

(Telegraphic.) *San Roque, June* 6, 1870, 3·30 P.M.

THE following telegram has just been communicated to me from Cadiz, 6th June, 1·34 A.M. :—

"To Gibraltar Post-office, Manuel Montegriffo. Affairs marching exceedingly well. John had interview with Chief. Expect we shall all get there to-morrow night. Inform His Excellency, and the family.—PEDRO."

Inclosure 2 in No. 55.

Sir R. Airey to Mr. Layard.

(Telegraphic.) *San Roque, June* 6, 1870, 6·30 P.M.

I HAVE just received the following telegram, dated Cadiz, 6th June, 2·25 P.M. :—

"Delivering cash to chief. Captive will arrive here by to-night's train.—RECANO."

Governor of Cadiz to Minister of the Interior :—

"This morning, at 11 o'clock, the ransom of the Messrs. Bonnell was given to the captors. The young Bonnell is expected at Cadiz to-night.—RODRIGUEZ."

Inclosure 3 in No. 55.

The Secretary to the Minister of the Interior.

(Translation.)
(Telegraphic.) *Cadiz, June* 7, 1870.

MR. BONNELL, the captive who still remained in the power of the brigands, has just been restored at Puerto Santa Maria. Yesterday I was able to obtain news concerning the authors of the crime; and have good grounds for hoping to succeed in the capture of the Chief, whose name and abode are known.

No. 56.

Mr. Herbert to Mr. Hammond.—(*Received June* 10.)

Sir, *Downing Street, June* 9, 1870.

WITH reference to previous correspondence regarding the capture by brigands, near Gibraltar, of Messrs. Bonnell, British subjects, I am directed by Earl Granville to request that you will move the Earl of Clarendon to inform his Lordship whether, as it would appear, that the Messrs. Bonnell have been set at liberty, Lord Clarendon desires to be furnished with copies of further papers from the Governor of Gibraltar, for the purpose of completing the correspondence.

I am, &c.
(Signed) ROBERT G. W. HERBERT.

No. 57.

Mr. Layard to the Earl of Clarendon.—(Received June 11.)

My Lord, *Madrid, June 8, 1870.*

IT is with much satisfaction that I was able to inform your Lordship yesterday that the two Messrs. Bonnell had been released. I feel bound to bear my testimony to the unceasing exertions made by the Spanish Government to obtain this result, and their anxious desire to do all in their power at any sacrifice to assure the safety of the captives. They consulted me, as your Lordship will have observed, upon every step which they took, and were at all times ready to act upon any suggestion that I might make, or that might come from the Governor of Gibraltar, with whom the Governor of Cadiz was directed to place himself in direct and immediate communication by going to San Roque. I am desirous of especially calling to your Lordship's notice the services rendered in this affair by the Under-Secretary of State for Foreign Affairs, Senor Don Bonifacio de Blas, to whom its management here was particularly entrusted, and who was in constant communication with me.

His Highness the Regent has shown throughout an earnest desire for the safety of the captives, and again yesterday begged me to convey to Her Majesty's Government the satisfaction which he experienced at their release.

I beg to inclose, for your Lordship's information, in order to complete the history of this affair, copies of the telégrams which I received since my despatch of yesterday was written.

I have, &c.
(Signed) A. H. LAYARD.

P.S.—I also beg to inclose, for your Lordship's information, copy of a despatch from Sir Richard Airey.

Inclosure 1 in No. 57.

Consul Reade to Mr. Layard.

(Telegraphic.) *Cadiz, June 7, 1870.*

RANSOM paid and remaining captive liberated. The two Bonnells proceed to Gibraltar in "Trinculo."

Inclosure 2 in No. 57.

Sir R. Airey to Mr. Layard.

(Telegraphic.) *San Roque, June 7, 1870, 5 P.M.*

I HAVE this moment received the following satisfactory telegram from Mr. Recano, dated, Cadiz Puerto, June 7, 10·45 A.M.:—"Captive released."

Inclosure 3 in No. 57.

The Governor of Cadiz to the Minister of the Interior.

(Telegraphic.) *San Roque, June 7, 1870.*

MR. BONNELL, jun., has just been liberated in the Port of Santa Maria.

Inclosure 4 in No. 57.

Sir R. Airey to Mr. Layard.

Sir, *Gibraltar, June 5, 1870.*

I HAVE the honour to acquaint your Excellency that yesterday Mr. John Bonnell, the elder of the two gentlemen seized by the Spanish brigands on the evening of the 21st ultimo, arrived here in the French steamer "Ville de Brest," from Cadiz.

Mr. John Bonnell had been released by the brigands in order to come to Gibraltar and obtain the stipulated ransom of 27,000 dollars; the life of his nephew, who still remains in their hands, being the guarantee for his immediate return with that sum.

As the Messrs. Bonnell, although possessing considerable property in Gibraltar and elsewhere, could not at once produce so large a sum in Spanish gold, which was part of the agreement, while the immediate return of Mr. Bonnell was insisted upon, I. caused that amount to be advanced to him from the Colonial chest.

After receiving the above sum in gold, Mr. John Bonnell, who is a very feeble debilitated man, naturally felt very nervous as to his proceeding in a public traffic steamer to Cadiz, there to be disembarked at nightfall with such a sum of money in his charge, and I therefore directed, with the concurrence of the Senior Naval Officer, that he and two or three friends should be conveyed to Cadiz in Her Majesty's ship "Trinculo," with directions that the money should be kept on board until arrangements could be made by Mr. John Bonnell for handing it over to those implicated, and for the liberation of his nephew.

The "Trinculo" left last evening, the passage being from ten to eight hours, and I am in early expectation of a telegram from Cadiz announcing the release of both the captives.

It appears that, immediately after sunset on the 21st ultimo, the captives were conveyed by this armed band, on led horses, through a most difficult and intricate country, to a wood in the mountains of the Sierra de Gazules, where they arrived early the following morning, and remained all day.

The next night they marched again, and arriving in the neighbourhood of a solitary house in the direction of Casavieja, their eyes were bandaged, and after being carried round and round for a considerable time were taken into a room looking into a small courtyard and stables; here they remained eight days whilst the brigands were arranging matters with other portions of the band, during which time they were well and civilly treated.

It was then decided that the captives should be separated, the younger Mr. Bonnell to be taken to some other place of concealment, and the uncle, with the Chief and another robber, to go to Cadiz, which was accomplished by railway.

They remained four days at Cadiz at a "posada," the chief robber frequently inviting and pressing Mr. Bonnell to come out and walk with him.

All things being settled, on the morning of the departure of the "Ville de Brest," Mr. John Bonnell was taken to the wharf to embark by himself, and when on the point of doing so, the other brigand came up to him, as if by chance, and said familiarly, "Ah! Mr. Bonnell, are you going to make an excursion to Gibraltar?"

I have forgotten to mention that during their eight days' séjour at the house before alluded to, the captives could hear considerable discussion as to their disposal by the brigands, some declaring that "these English were difficult people to deal with," and would get them punished afterwards, and it would be better to take from them whatever they had, and cut their throats.

I have, &c.
(Signed) RICHARD AIREY.

No. 58.

Mr. Layard to the Earl of Clarendon.—(*Received June* 11.)

My Lord, *Madrid, June* 8, 1870.

I BEG to inclose, for your Lordship's information, translation of a telegram communicated to me by the Minister of the Interior, stating that three out of the four brigands concerned in the capture of the Messrs. Bonnell had been killed by the Spanish Guardia Civil on their return from Puerta Santa Maria, where they had been to receive the ransom for those gentlemen.

I also inclose a copy of a telegram from Her Majesty's Consul at Seville to the same effect, and stating that the ransom had been found on the brigands.

I have, &c.
(Signed) A. H. LAYARD.

Inclosure 1 in No. 58.

The Governor of Seville to the Minister of the Interior.

(Translation.)
(Telegraphic.) *Seville, June* 8, 1870.

THE Governor of Cadiz having announced by telegram that the persons who captured the Englishmen were going to this city on horseback from Puerto Santa Maria, where they had divided amongst them the ransom of the Bonnells, I took the most prompt and efficacious measures to seize them if they really wished to enter into this place. Accordingly there were placed without, some of the Guardia Civil of Infantry and Cavalry, reinforced by twenty policemen, to watch during the night and until further orders the approaches and roads around the city. I watched impatiently all the night for the result of the precautions taken, and at 4 o'clock in the morning the Commander of the Guardia Civil, Villacampa, informed me verbally that the brigands, four in number, had been surprised beyond the Venta de Eritana. They defended themselves, firing upon the guards and the policemen, who were at that point. It ended by the death of three of the brigands, the fourth having escaped; but he is followed up with the greatest activity. We have had the misfortune to have had wounded in the thigh by a ball one of the Guardia Civil. I will give your Excellency further details when required.

Inclosure 2 No. 58.

Consul Williams to Mr. Layard.

(Telegraphic.) *Seville, June* 8, 1870.

THREE brigands have been shot by the river side. One escaped. Ransom money in their girdles.

Inclosure 3 in No. 58.

Sir R. Airey to Mr. Layard.

(Telegraphic.) *Gibraltar, Wednesday,* 10 A.M.

MESSRS. BONNELL arrived here last night in gun-boat "Trinculo" perfectly well.

No. 59.

Mr. Layard to the Earl of Clarendon.—(*Received June* 11.)

My Lord, *Madrid, June* 8, 1870.

I HAD the honour to forward to your Lordship yesterday evening, the following telegram:—

"Minister of the Interior informs me, that two English officers were fired at near Gibraltar last night. The two men who attacked them were captured. The Spanish Government is determined to take the severest measures to clear the country of such malefactors, and hopes that Her Majesty's Government will co-operate and prevent their taking refuge in Gibraltar."

I must apologize to your Lordship for an error in this telegram. Instead of "being fired at," it should have been "attacked." The error arose from the Spanish words "*sin* armas de fuego" having been read "*con* armas de fuego."

I have, &c.
(Signed) A. H. LAYARD.

No. 60.

Mr. Layard to the Earl of Clarendon.—(*Received June* 11.)

My Lord, *Madrid, June* 8, 1870.

I HAVE the honour to inclose, for your Lordship's information, translation of a letter, accompanied by a telegram, which I received yesterday from Señor Rivero, the Minister of the Interior.

The Governor of Cadiz, who had proceeded to San Roque in order to co-operate with Sir Richard Airey in the release of the Messrs. Bonnell, telegraphs that two men had attacked two English officers of the garrison of Gibraltar, on their return from the fair of Algeciras, with the intention of carrying them off, but without success, and that they had been subsequently captured by the Civil Guard.

Señor Rivero informs me that, in conjunction with the President of the Council of Ministers, he intends to take severe measures to clear the country in the vicinity of Gibraltar of the malefactors who abound there, and he expresses a hope that Her Majesty's Government will give orders to the authorities of Gibraltar to lend their aid in order that the measures may not prove abortive, the malefactors taking refuge in that fort, the place of refuge of those in Spain who escape from the action of the Tribunals.

His Excellency further says that if Her Majesty's Government will associate itself with the efforts of the Spanish Government, in a short time we shall have the satisfaction of feeling that a complete security, such as has never before existed, will be established in the country which separates Spain from Gibraltar.

I thought it best to see Señor Rivero at once, and to inform him that, although I had telegraphed the substance of his communication to your Lordship in order that no time might be lost, it would be more in conformity with practice if the Minister of Foreign Affairs were to address me officially upon the subject.

He informed me that Señor Sagasta, in order to avoid the delay of sending information about the Messrs. Bonnell through two Departments, had requested him to communicate with me directly, and that consequently he had done so.

A Council of Ministers, he said, would be held that evening to consider the measures to be taken to prevent such outrages as had occurred during the last few days, and the decision to which they might arrive would be communicated to me immediately by Señor Sagasta; that there was no time to be lost in giving instructions to the authorities at Gibraltar, as, encouraged by the success of those who had captured the Messrs. Bonnell and had obtained a large sum of money as ransom, all the malefactors in the country would be endeavouring to effect similar captures. He trusted, however, that he should be able to arrest the men who had carried off the Messrs. Bonnell, as he knew their names, and was on their track. All he feared was that they would succeed in reaching Gibraltar, where they would be safe under the protection of the British flag.

In the evening the Regent spoke to me on the same subject, and asked me whether it would be possible to come to some arrangement by which criminals taking refuge in Gibraltar might be surrendered, Spain agreeing on her part to deliver such as might escape from that place.

I replied that I would submit what His Highness had said to Her Majesty's Government. His Highness declared that the brigands who had carried off Messrs. Bonnell would be put to death if they were caught.

I have &c.
(Signed) A. H. LAYARD.

Inclosure 1 in No. 60.

Señor Rivero to Mr. Layard.

(Translation.)

Sir, *Ministry of the Interior.*

TO the story of the capture of the Messrs. Bonnell, of which I am about to give you an account, we must add the fresh incident referred to in Governor of Cadiz telegram from San Roque, copy of which I have the honour to inclose.

As you will see, the Guardia Civil came immediately to the rescue, and with favourable results, of the English officers who were attacked by the ruffians.

But as it appears that these persons are going to devote themselves to fresh crimes in the neighbourhood of Gibraltar, I ought to say that, in conjunction with the President of the Council of Ministers, I am going to occupy myself unceasingly in clearing that country of the bad characters who abound there, in order that directions be sent from your Government that the authorities of Gibraltar should lend their aid to prevent the severe measures, about to be adopted by the Minister of the Interior, from remaining unavailing, by shelter being given to the criminals in the Place of Gibraltar, which is a city of refuge for all those in Spain who escape the Courts of Justice.

If the efforts of the British Government are joined to those of the Spanish Government, you may reckon on our having the satisfaction of knowing that there

now reigns a complete tranquillity, such as there never has done before in the country between Spain and Gibraltar.

I repeat, &c.
(Signed) NICOLAS MARIA RIVERO.

Inclosure 2 in No. 60.

The Governor of Cadiz to the Minister of the Interior.

(Translation.)
(Telegraphic.) *San Roque, June* 7, 1870.

LAST night two English officers of the Gibraltar garrison, on returning from the fair of Algeciras, were surprised by two men without fire-arms, who endeavoured to capture them; they killed with a knife the horse of one of the officers, but the latter succeeded in making their escape, and communicating with the Guardia Civil, who immediately went in pursuit of the robbers, whom they captured, wounding one who attempted to escape seriously.

The result of the affair of the Bonnells has been to awaken the cupidity of all the bad characters in these parts.

I am going to adopt measures which will produce a good effect, but it is indispensable that the Government of Her Britannic Majesty and of His Highness the Regent should take together other steps, which I shall have the honour of pointing out to you.

No. 61.

The Secretary to the Admiralty to Mr. Hammond.—(Received June 11.)

Sir, *Admiralty, June* 10, 1870.

I AM commanded by my Lords Commissioners of the Admiralty to transmit to you, for the information of the Secretary of State for Foreign Affairs, copy of a letter from the Captain of Her Majesty's ship "Enterprise," relative to the probability of the release of the British subjects captured by Spanish brigands near Gibraltar.

I am, &c.
(Signed) THOS. WOLLEY.

Inclosure in No. 61.

Commander Morant to Captain Phillimore.

Sir, *"Enterprise," Gibraltar, June* 2, 1870.

I BEG to report, that Mr. Mark, Her Britannic Majesty's Consul at Malaga, requested me to inform Sir Richard Airey, on my arrival here, that the Governor of Malaga had shown him a letter from the Alcade de Ronda, reporting that the Messrs. Bonnell were in good health, but still in the possession of the brigands, and that the place of their captivity is known; and in all probability they would be released in the course of a few days, and be forwarded to Gibraltar or Malaga.

I have, &c.
(Signed) GEO. DIGBY MORANT.

No. 62.

The Earl of Clarendon to Mr. Layard.

Sir, *Foreign Office, June* 11, 1870.

I INSTRUCTED you, by my despatch of the 9th instant, to convey to the Spanish Government the warm acknowledgments of that of Her Majesty, for the promptitude and earnestness of the measures taken by them to obtain the release of the British captives.

I have this morning received your despatch of the 8th of June, bearing further testimony to the good-will shown by the Regent, and the unceasing exertions of the

Government, and more particularly of Señor Don Bonifacio de Blas, to whom, as Under-Secretary of State for Foreign Affairs, the management of the business at Madrid, was particularly intrusted, to insure the safety of the British captives, and to effect their release; and, with reference to what you have now reported, I have again to instruct you cordially to acknowledge, on behalf of Her Majesty's Government, the kind attention shown by that of Spain throughout the whole affair.

I shall recommend Earl Granville to convey to Sir Richard Airey his entire approval of the zeal and activity displayed by him.

I am, &c.
(Signed) CLARENDON.

No. 63.

The Earl of Clarendon to Mr. Layard.

Sir, *Foreign Office, June* 13, 1870.

WITH reference to your despatch of the 8th instant, I transmit, herewith, for your information, copies of two letters which I have caused to be addressed to the Colonial Office,* suggesting that instructions should at once be given to the Governor of Gibraltar to furnish Her Majesty's Government with a complete account of all the circumstances connected with the late seizure by brigands of the Messrs. Bonnell, and to co-operate as far as possible with the Spanish Government in their efforts to suppress brigandage in the neighbourhood of that fortress.

I am, &c.
(Signed) CLARENDON.

No. 64.

Mr. Hammond to Mr. Herbert.

Sir, *Foreign Office, June* 13, 1870.

IN reply to your letter of the 9th instant, I am directed by the Earl of Clarendon to request you to inform Earl Granville that his Lordship considers it advisable that copies of any further correspondence between the Colonial Office and the Governor of Gibraltar relating to the capture of the Messrs. Bonnell by Spanish brigands should be supplied to this office.

I am, &c.
(Signed) E. HAMMOND.

No. 65.

Mr. Hammond to Mr. Herbert.

Sir, *Foreign Office, June* 13, 1879.

I AM directed by the Earl of Clarendon to transmit to you herewith, for the information of Earl Granville, a copy of a letter addressed by Sir R. Airey to Her Majesty's Minister at Madrid,† reporting the steps his Excellency had taken to assist the elder Mr. Bonnell to raise and convey to the brigands the sum demanded by them for the ransom of himself and his nephew; and I am to request that you will recommend for the entire approval of Lord Granville the zeal and activity displayed by the Governor of Gibraltar.

I am, &c.
(Signed) E. HAMMOND.

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* Nos. 54 and 66.

† Inclosure 4 in No. 57.

No. 66.

Mr. Hammond to Sir F. Rogers.

Sir, *Foreign Office, June* 13, 1870.

I AM directed by the Earl of Clarendon to transmit to you herewith, to be laid before Earl Granville, copies of a despatch and its inclosures from Her Majesty's Minister at Madrid* relative to the recent acts of brigandage in Spain and to the measures which the Spanish Government are of opinion should be adopted to put a stop to such outrages; and, with reference to my letter of the 9th instant, I am to request Earl Granville's earliest and most serious attention to the contents of this despatch, and to suggest that orders should be sent by telegraph to the Governor of Gibraltar to co-operate, as far as he legally can, with the praiseworthy efforts of the Spanish Government to put down brigandage in the neighbourhood of Gibraltar.

It would be a great scandal to England if any measures were neglected by which such desperate characters might be prevented from finding refuge in a British fortress, or if every endeavour was not made to detect and, if possible, punish any resident in the fortress who may be acting in concert and co-operation with brigands; and no surer steps could be taken for this purpose than by checking the contraband trade which is carried on from the fortress, and which it can scarcely be doubted brings the inhabitants of the place into association with such lawless characters as those who carried off Messrs. Bonnell, and who were engaged in the other outrage referred to in this despatch, and who, the Spanish Government justly fear, may be encouraged by impunity to commit still grosser crimes.

I am, &c.
(Signed) E. HAMMOND.

No. 67.

Consul Reade to the Earl of Clarendon.—(Received June 13.)

My Lord, *Cadiz, June* 6, 1870.

I HAVE the honour to transmit herewith the inclosed copy of a despatch which I this day addressed to Her Majesty's Minister at Madrid, informing his Excellency of the arrival of Her Majesty's ship "Trinculo," with Mr. Bonnell, of Gibraltar, and of the subsequent payment of the ransom demanded by brigands for the release of Mr. Bonnell the younger, who is still detained by them in captivity.

I have, &c.
(Signed) THOS. F. READE.

Inclosure in No. 67.

Consul Reade to Mr. Layard.

Sir, *Cadiz, June* 6, 1870.

HAVING returned yesterday from Gibraltar, I take the earliest opportunity of reporting to your Excellency the further information I have been able to gather from private as well as official sources, respecting the fate of the two inhabitants of that garrison, who were lately kidnapped by Spanish brigands, the course of procedure which it became my duty under the circumstances to pursue, and some observations that occur to me with reference to the measures adopted and negotiations pending for the liberation of the captives.

On my arrival at Gibraltar I found that the intelligence which I communicated to your Excellency in my letter of the 31st ultimo was confirmed, and that messages of a similar purport were being received daily from one or other of the three emissaries who had been dispatched in quest of the captives. As copies of these messages have been duly transmitted to your Excellency by the Governor of Gibraltar, I will say nothing more of them than that, while the more reassuring of them arrived from Malaga, one of the two captives, the elder Bonnell, made his appearance at Cadiz, agreeably with the supposition which I ventured in my last letter to your Excellency to express regarding the district in which both captives have been, and the younger one continues to be, confined.

* No. 60.

The emissaries, therefore, had in reality very little to do with the negotiation ultimately concluded with the brigands, for it is evident the latter have acted quite independently of them.

From the Governor of Gibraltar, as well as from Don Frederico Villalba, the Governor of the province, I learnt the steps which had been taken in the affair, and which consisted in the withdrawal, for the time being, of all persecution of the brigands, and the employment of the emissaries above referred to. The brigands, it was felt, would sooner or later make overtures for the settlement of the affair, and it was consequently decided by the authorities to wait patiently until such overtures came. A day or two later, that is to say, on the 4th instant, as I had the honour to telegraph to your Excellency, the elder Mr. Bonnell arrived at Gibraltar in a French steamer from Cadiz, with a proposal from the brigands for the release of his nephew by the payment of a ransom of 27,000 dollars. The sum demanded was by the Governor's order supplied from the Colonial chest, and Her Majesty's gun-boat "Trinculo" having been placed at Mr. Bonnell's disposal, that gentleman proceeded in her to Cadiz the same evening. I followed in a merchant-steamer some hours later.

The utmost secrecy having been enjoined with regard to the "Trinculo's" mission here, no communication passed between her and this Office yesterday. At an early hour, however, this morning, some of Mr. Bonnell's agents called on me, and, after informing me that they had found it impracticable to pay the ransom, as had been intended, on board ship, requested that the money might be brought to the Consulate, and there delivered by them to the parties who had been appointed by the brigands to receive it. I, of course, consented to this arrangement, and it was accordingly carried out at about 1 o'clock P.M.

The brigands are now in possession of the whole of the ransom money, and, conformably with an engagement formally entered into, have already proceeded to some rendezvous in the neighbourhood of Jerez, where the remaining captive is to be produced and handed over to his friends this evening or to-morrow morning. That this engagement will be faithfully carried into effect I have every reason to believe from the want of cunning hitherto displayed by the brigands, whose early arrest or destruction by the local authorities appears to me to be a matter of easy accomplishment and consequent certainty.

Their movements and proceedings throughout the whole period of their venturous enterprize have been marked by the most stolid stupidity, as well as daring.

From information confidentially imparted to me, and in every respect reliable, it would appear that the Messrs. Bonnell and their brigand masters passed the first day of their flight in a wooded ravine of the cork-wood called the Soto Gordo, a well-known spot about eight miles from Gibraltar; that they then crossed the plain of Almoraima to an old ruin called La Hermita del Rosario, which is now used as a "ventorrillo," or small country tavern, and is distant about thirty miles from Gibraltar; and that, after remaining in concealment there eight days, they proceeded to Jerez, where they were located, up to the 1st of this month, in a large and comfortable house. At Jerez the two captives were separated, the older man being taken by the Chief of the band to Cadiz, boarded and lodged there in his (brigand's) company, and embarked by the latter on board the "Ville de Brest" steamer for Gibraltar. So regardless, indeed, do the brigands appear of their personal safety that I am positively assured the whole of the band implicated in the Bonnell affair promenaded the Cadiz streets for several hours this morning. Of this circumstance the Acting Provincial Governor (as he himself told me) is thoroughly cognizant; and I have no doubt that, as soon as the younger Bonnell obtains his liberty, some vigorous measures against the brigands will be resorted to.

The brigands, they tell me, are Cordova men, and have no connection whatever with Ronda, as had been pretty generally alleged. They have been long known as muleteers, or oil-carriers; and their chief, who goes by the appellation of Don Antonio, has all the appearance of a bull-fighter.

The amount first demanded by the brigands was, as your Excellency is doubtlessly aware, 5,000 dollars; and I fear it is owing to the unfortunate notoriety which the affair assumed from the commencement, increasing as it did with every phase of the proceedings adopted for a satisfactory solution, as well as to the great interest and solicitude so openly manifested in regard of the situation of the captives, that the sum which had ultimately to be paid was raised to more than five times its original import.

Another reason for the enormity of the sum asked, is probably to be found in a wish to be provided with ample means for bribing over to the brigands' interest the most dangerous of their pursuers.

Had the more prudent and equally feasible plan been adopted of meeting the

brigands, or their representatives, at some given point outside of any town, and effecting with them a simultaneous exchange of the price and object of the ransom, the certainty of the captives' release would have been more assuredly secured than under existing circumstances.

The parties, however, more directly interested in the present transaction appear very confident of a successful result, and I therefore hope to be able to telegraph to your Excellency this evening, or to-morrow morning, that the remaining captive has been set at liberty.

I have, &c.
(Signed) THOS. F. READE.

No. 68.

Consul Reade to the Earl of Clarèndon.—(*Received June* 13.)

My Lord. *Cadiz, Juue* 7, 1870.

I HAVE the honour to inclose a copy of a despatch which I this day addressed to Her Majesty's Minister at Madrid, announcing the liberation of the last of the captives, Mr. Bonnell junior.

I have, &c.
(Signed) THOS. F. READE.

Inclosure in No. 68.

Consul Reade to Mr. Layard.

Sir, *Cadiz, June* 7, 1870.

REFERRING to my despatch of yesterday, I have the honour to report that I this day telegraphed to your Excellency the following message: "Ransom paid and remaining captive liberated. The two Bonnells proceed to Gibraltar in 'Trinculo.'"

Mr. Bonnell the younger arrived here at noon from Jerez, having been conveyed to that place at 2·30 A.M. this morning, from a point about ten miles distant from it in the direction of Arcos.

The brigands, on leaving him, declared they were bound to Estremadura.

Mr. Bonnell, whom I have myself seen, can add very little information, that is to say, information of an interesting character, to what is contained in my last despatch. Like his uncle, he speaks in favourable terms of the treatment he met with while in the company of the brigands.

I have thought it my duty to communicate immediately to the Acting Provincial Governor the fact that both captives have been released, and am informed by him that the movements of the brigands have, for some time past, been closely watched, and that one or more of them will probably be captured this day.

From intelligence which he received while I was with him, he appeared satisfied they have taken the direction of Seville.

It is a curious circumstance that in their negotiation for the release of Messrs. Bonnell, the brigands never stipulated for any "indulto," or amnesty.

I have, &c.
(Signed) THOS. F. READE.

No. 69.

Mr. Layard to the Earl of Clarendon.—(*Received June* 13.)

My Lord. *Madrid, June* 9, 1870.

I BEG to inclose, for your Lordship's information, copy of a despatch from Mr. Reade, Her Majesty's Consul at Cadiz, which is of interest, as giving an account of the proceedings of the men who were concerned in the outrage committed upon the Messrs. Bonnell.

Mr. Reade informs me to-day that the fifth brigand, four alone having been intercepted on their way to Seville, is still in Cadiz, having fallen ill; that the Spanish authorities are aware of the fact, and have taken measures for his capture. I have not

yet heard of the result of the pursuit of the brigand who escaped from the attack of the Guardia Civil near Seville.

I have, &c.
(Signed) A. H. LAYARD.

Inclosure in No. 69.

Consul Reade to Mr. Layard, June 6, 1870.

[See Inclosure in No. 67.]

No. 70.

Consul Reade to the Earl of Clarendon.—(*Received June* 14.)

My Lord, *Cadiz, June* 8, 1870.

I HAVE the honour to report that I this day forwarded to your Lordship a telegram to the following effect:—

"Three of the brigands who kidnapped the Bonnells were shot near Seville last night. The other two are tracked or surrounded."

From information which the Acting Governor of this province has communicated to me, it would appear that an encounter between four of the five brigands above referred to and three men of the Guardia Civil took place in the environs of Seville at about daybreak this morning;* that the chief of the band, Francisco Antonio Martinez by name, and two of his companions were shot dead, and that the fourth brigand, who escaped after severely wounding one of the Guardia Civil, was, according to the last accounts, being closely pursued by the authorities.

The remaining or fifth brigand, I am further assured, is confined to a sick bed at Utrera, and unable to elude the vigilance of the police.

I have, &c.
(Signed) THOS. F. READE.

No. 71.

Mr. Layard to the Earl of Clarendon.—(*Received June* 15.)

My Lord, *Madrid, June* 11, 1870.

I AM authorized to inform your Lordship that the Council of Ministers had decided, before the death of three of the men who committed the outrage upon the Messrs. Bonnell, and the recovery of part of the ransom money, that the Spanish Government should pay the sum exacted for the release of those gentlemen.

I have, &c.
(Signed) A. H. LAYARD.

No. 72.

The Secretary to the Admiralty to Mr. Hammond.—(*Received June* 15.)

Sir, *Admiralty, June* 13, 1870.

I AM commanded by my Lords Commissioners of the Admiralty to transmit to you, for the information of the Secretary of State for Foreign Affairs, the inclosed copies of a despatch from the Senior Naval Officer at Gibraltar reporting that he had sent the "Trinculo" gun-boat to Cadiz with Mr. Bonnell, who, with his nephew, had been kidnapped near Gibraltar on the 21st ultimo, and of the orders given to the officer commanding that vessel on the occasion.

I am, &c.
(Signed) THOS. WOLLEY.

* Not last night, as erroneously stated in the telegram.—T. F. R.

June 14.

P.S.—A copy of a further letter from Captain Phillimore, dated 8th instant, with copy of its inclosures, reporting the return to Gibraltar from Cadiz of Her Majesty's ship "Trinculo," is also transmitted herewith.

T. W.

Inclosure 1 in No. 72.

Captain Phillimore to the Secretary to the Admiralty.

Sir, "*Redpole*," *Gibraltar*, *June* 5, 1870.

I HAVE the honour to transmit herewith, for the information of the Lords Commissioners of the Admiralty, the duplicate of a despatch which I have addressed to the Commander-in-chief of the Mediterranean, on the subject of having despatched Her Majesty's gun-boat "Trinculo" to Cadiz with Mr. Bonnell, who, with his nephew, was kidnappped close to the Spanish lines near Gibraltar on the 21st ultimo.

2. Mr. Bonnell arrived here from Cadiz on the 4th instant, under an assumed name, having been sent on his parole by the brigands, for the enormous sum of 27,000 dollars, and his nephew is detained near Cadiz till Mr. Bonnell's return with the money.

3. Mr. Bonnell was apprehensive, if he was to proceed in the ordinary packet with this sum, of being plundered on his way, and that the life of his nephew would be forfeited; and I at once acceded to the request of Sir Richard Airey for his being conveyed with his four friends in the "Trinculo."

I have, &c.
(Signed) AUGUSTUS PHILLIMORE.

Inclosure 2 in No. 72.

Orders addressed to Lieutenant and Commander Crofton.

(Confidential.)

By Augustus Phillimore, Esq., Captain in Her Majesty's Navy, and Senior Naval Officer present, &c.

YOU will receive on board Her Majesty's gun-boat "Trinculo," under your command, Mr. Bonnell, of this place, who was recently seized by brigands, and who is desirous of returning to Cadiz with a sum of money which he has promised the outlaws to pay for the ransom of himself and his nephew.

You will take Mr. Bonnell and the people who accompany him to Cadiz this evening, leaving soon after dark, and, unless anything unforeseen should occur, return with him and his nephew to this place as soon as he has arranged his business.

As many circumstances, trifling in themselves, may arouse suspicion in the miscreants who have been guilty of this outrage, and place the life of the younger Bonnell, now in their power, in jeopardy, the matter should be kept as quiet as possible, and no communication should take place with Cadiz by the officers or men on board Her Majesty's gun-boat "Trinculo" beyond what is absolutely necessary.

Dated on board the "Trinculo," at Gibraltar, this 4th day of June, 1870.

(Signed) AUGUSTUS PHILLIMORE.

Lieutenant and Commander the Hon. Francis Crofton, R.N.,
Her Majesty's gun-boat "Trinculo."

P.S.—Steam to be used for the speedy and due performance of this service.

A. P.

Inclosure 3 in No. 72.

Captain Phillimore to the Captains and Officers of Her Majesty's Ships and Vessels on this part of the Mediterranean Station.

Sir, "*Trinculo*," *Gibraltar*, *June* 3, 1870.

THE seizure of two merchants belonging to Gibraltar by armed bandits while within a few hundred yards of Spanish sentinels, and the ineffectual results of the diligent search which has been made by all the Spanish authorities for thirteen days, and the attempts at recovering those gentlemen, show that the present state of Spain is so very unsettled

and unsafe that the greatest possible caution should be exercised before granting leave to officers or men to visit any part of the Spanish territories, more especially by night.

I have, &c.
(Signed) AUGUSTUS PHILLIMORE.

Inclosure 4 in No. 72.

Captain Phillimore to the Secretary to the Admiralty.

Sir, "*Trinculo*," *Gibraltar, June* 8, 1870.

WITH reference to my letter of the 5th instant, I have the honour to report that Her Majesty's gun-boat "Trinculo" returned here this morning at 4 A.M., and I inclose Lieutenant Crofton's report of proceedings.

I have, &c.
(Signed) AUGUSTUS PHILLIMORE.

Inclosure 5 in No. 72.

Lieutenant and Commander Crofton to Captain Phillimore.

Sir, "*Trinculo*," *Gibraltar, June* 8, 1870.

IN pursuance of your orders dated the 4th instant, to convey Mr. Bonnell, his four friends, and the ransom of 27,000 dollars, to Cadiz, I have the honour to report that those gentlemen, together with the ransom money, embarked on board the gun-boat I command at 9·45 P.M. that evening, and on steam being ready, at 10 P.M. I proceeded, arriving at Cadiz at 9·30 the following morning.

Three of the gentlemen immediately disembarked in the gig; Mr. Bonnell and friend remaining on board till noon, when he landed in a shore boat.

At 10 o'clock next morning (6th June) two of Mr. Bonnell's friends came on board, and informed me that that gentleman was at the Hotel "Tres Reyes" with the brigand Chief, and that he was very anxious that the ransom money should be sent on shore to him secretly, and as soon as possible, as the Chief was very impatient. I at once caused the ransom to be placed in canvass waist-belts, and proceeded with it to the office of Her Britannic Majesty's Consul, where I was directed to take it to the Hotel de Paris. I there delivered the money to Mr. Bonnell's friends, who conveyed it to the Hotel "Tres Reyes," at which Mr. Bonnell and the brigand Chief were staying.

Mr. Bonnell arrived at the Hotel de Paris at 3·30 P.M., after paying the money, and stated that the robbers were very nervous, and fearful of being watched, had placed the belts round their waists without counting the money, and just left Cadiz by the 2·30 train, having promised to release his nephew that night or next morning.

Next day at 1 P.M. I received a letter from Mr. Bonnell, informing me of his nephew's arrival in Cadiz, and requesting me to send a boat to embark himself and party at 3 o'clock, at which hour they arrived on board.

I then weighed and proceeded for this port, arriving at 4·30 A.M. this morning.

I have, &c.
(Signed) FRANCIS CROFTON.

No. 73.

Mr. Herbert to Mr. Hammond.—(Reeeived June 15.)

Sir, *Downing Street, June* 15, 1870.

I AM directed by Earl Granville to transmit to you, for the information of the Earl of Clarendon, with reference to former correspondence on the subject of Spanish brigandage, a copy of a telegram which his Lordship sent on the 13th instant to the Governor of Gibraltar, and of the answer which he has received.

I am also to transmit a copy of another telegram received to-day from Sir R. Airey, relating to the killing of Lieutenant Fraser's horse.

I am, &c.
(Signed) ROBERT G. W. HERBERT

Inclosure 1 in No. 73.

Earl Granville to Sir R. Airey.

(Telegraphic.) *Downing Street, June* 13, 1870, 12·40 P.M.

CO-OPERATE as far as you legally can with the Spanish Government to put down brigandage. Take care that, if possible, accomplices within the fortress are brought to justice.

Inclosure 2 in No. 73.

Sir R. Airey to Earl Granville.

(Telegraphic.) *Gibraltar, June* 14, 1870, 6·10 P.M.

YOUR telegram dated 13th received, and will be acted on.

Inclosure 3 in No. 73.

Sir R. Airey to Earl Granville.

(Telegraphic.) *Gibraltar, June* 14, 1870, 6·21 P.M.

KILLING of Lieutenant Fraser's horse, June 6th, not connected in any way with brigandage. Malefactors in hands of Spanish authorities.

No. 74.

Consul Reade to the Earl of Clarendon.—(Received June 16.)

My Lord, *Cadiz, June* 11, 1870.

WITH reference to my despatch of the 8th instant, reporting the summary and terrible retribution that had overtaken the brigands implicated in the Bonnell affair, I have the honour to transmit to your Lordship the following extract of a despatch I have this day addressed to the Governor of Gibraltar:—

"I have very little to add to the scanty particulars which have already appeared in the Spanish newspapers on the subject, and acquired such general publicity.

"It may not, however, perhaps, be equally well known that the horse of the fourth brigand, who escaped from the encounter with the Guardia Civil, was subsequently captured without its rider, and that the latter is supposed to have entered Seville from another quarter, unobserved. Of this I have been made acquainted by the Acting Provincial Governor, who also tells me, with regard to the other brigand implicated, or rather known to be implicated, in the Bonnell affair, that he was traced to a house in Utrera, where he was laid up with an illness which prevented his proceeding further, and that, notwithstanding the measures that had been taken to prevent his getting off, had contrived, somehow or other, to elude the vigilance of the police and disappear.

"On the news reaching Cadiz, two days ago, that three of the brigands had been shot I requested, with a view to the more satisfactory identification of the dead bodies, that photographs of the latter might be taken, the expense of which I said I would gladly bear. The Acting Provincial Governor, to whom I addressed myself, was good enough to communicate my wish to the Governor of Seville by telegraph; and the application having been courteously acceded to by his Excellency, I am this day placed in possession of the first proof taken of the likenesses I had solicited. These I have the honour to forward to your Excellency, in case you may think proper to ascertain whether the Messrs. Bonnell can recognize the individuals represented.

"Only 3,500 dollars, or about that sum, of the ransom money appears as yet to have been recovered, and I fear it is not very likely that the remainder, or at any rate any considerable portion of the remainder, will be found.

"Should it unfortunately become necessary, on some future occasion, to make any similar remittance (a contingency which I am happy to regard as a most improbable one) I would humbly suggest that the money may be paid in doubloons marked in a way that might lead possibly to the subsequent detection of the parties into whose hands they may have wrongfully passed.

I have, &c.

(Signed) THOS. F. READE.

No. 75.

Sir F. Rogers to Mr. Hammond.—(Received June 17.)

Sir, *Downing Street, June 17, 1870.*

I AM directed by Earl Granville to acknowledge the receipt of your letter of the 13th instant, and to acquaint you, for the information of the Earl of Clarendon, that on that day a telegram was sent to the Governor of Gibraltar, instructing him to co-operate, as far as he legally can, with the Spanish Government to put down brigandage, and to take care that, if possible, accomplices within the fortress are brought to justice.

Lord Granville desires me further to transmit to you, for Lord Clarendon's information, a copy of a despatch which he has addressed to the Governor by to-day's mail, and to suggest that the Spanish Government should be requested to furnish facts, or at least specific allegations, in support of the statement of Señor Rivero, that Gibraltar is a place of refuge for malefactors escaping from the action of the Spanish Tribunals.

Lord Granville entirely concurs with the Regent, that an Extradition Ordinance should be passed in Gibraltar, of the kind passed in other Colonies, to take effect so soon as corresponding provisions shall have been made by the Spanish Government respecting criminals escaping from Gibraltar into Spain; and with Lord Clarendon's concurrence his Lordship will have a draft Ordinance prepared and sent out to Sir R. Airey, to enact by Proclamation.

I am, &c.
(Signed) FREDERIC ROGERS.

Inclosure in No. 75.

Earl Granville to Sir R. Airey.

Sir, *Downing Street, June 17, 1870.*

WITH reference to my telegram of the 13th instant, I have the honour to transmit to you, for your consideration, a copy of a letter from the Foreign Office, covering copies of a despatch and its inclosures, from Her Majesty's Minister at Madrid, regarding the recent acts of brigandage in Spain, and the measures which, in the opinion of the Spanish Government, should be taken, to obviate the recurrence of such outrages.

I have to call your special attention to the allegation made by Señor Rivero, that Gibraltar is a place of refuge for malefactors escaping from the action of the Spanish Tribunals; and I have to request that you will report to what extent this is the case.

I have, &c.
(Signed) GRANVILLE.

No. 76.

Mr. Herbert to Mr. Hammond.—(Received June 18.)

Sir, *Downing Street, June 17, 1870*

REFERRING to your letter of the 13th instant, I am directed by Earl Granville to transmit to you, for the information of the Earl of Clarendon, a copy of a despatch from the Governor of Gibraltar respecting the recent capture of the Messrs. Bonnell by Spanish brigands, and to acquaint you that copies of any further correspondence between Lord Granville and Sir R. Airey on this subject will be transmitted for the information of the Foreign Office.

I am, &c.
(Signed) ROBERT G. W. HERBERT.

Inclosure 1 in No. 76.

Sir R. Airey to Earl Granville.

Sir, *Gibraltar, May* 28, 1870

I HAVE the honour to acknowledge the receipt of your Lordship's telegram dated 24th May, as follows:—

"*Tuesday*, 4·20 P.M.

"Keep Mr. Layard fully informed by telegraph with any information you may obtain respecting the captives, and act in complete concert with him."

And in continuation of my previous despatches to report that I forwarded to your Lordship on the 27th instant the following telegram:—

"*Friday*, 4 P.M.

"Up to this date no intelligence or trace of Messrs. Bonnell."

I also beg to transmit for your Lordship's information a complete copy of the correspondence which has passed between myself and Mr. Layard, Her Majesty's Minister at Madrid, upon this unfortunate affair, up to this date.

Up to the present time no information has been received here of the movements or whereabouts of the brigands and the Messrs. Bonnell, and no message has been received from the three emissaries who have gone in search of them.

I have, &c.
(Signed) RICHARD AIREY.

Inclosure 2 in No. 76.

Sir R. Airey to Mr. Layard.

Sir, *Gibraltar, May* 22, 1870.

WITH reference to my telegram of this day's date to the following effect, "Messrs. John Bonnell and John Antonio Bonnell, highly respectable British subjects, were captured and carried off last evening by Spanish brigands at about four miles from Gibraltar, in Spanish territory," I am in communication with the Spanish authorities at San Roque and Algeciras.

I have the honour to transmit herewith, for your Excellency's information, a copy of a communication which has been submitted to me by Mr. Varese, reporting the circumstances, so far as they are known at present, of the capture of these gentlemen and of the steps already taken by the authorities at the Spanish lines for the pursuit of the persons implicated in this extraordinary outrage.

I lost no time in placing myself in communication with the Governor of Algeciras, the authorities at San Roque, and the Commandant at the Spanish lines; and I shall not fail to acquaint your Excellency with any report I may receive from the Spanish authorities.

Meanwhile I beg to solicit your Excellency's prompt assistance and influence with the Spanish Government for the speedy release of the two captives, who, I have reason to believe, are prepared to pay any reasonable ransom that may be demanded by their captors

I have, &c.
(Signed) RICHARD AIREY.

Inclosure 3 in No. 76.

Deposition of Joseph Varese.

[See Inclosure 5 in No. 22.]

Inclosure 4 in No. 76.

Sir R. Airey to the Governor of Algeciras, May 22, 1870.

[See Inclosure 4 in No. 31.]

Inclosure 5 in No. 76.

Sir R. Airey to Mr. Layard, May 23, 1870.

[See Inclosure 1 in No. 25.]

Inclosure 6 in No. 76.

Señor Gatrid to Sir R. Airey, May 22, 1870.

[See Inclosure 2 in No. 25.]

Inclosure 7 in No. 76.

Señor Gatrid to Sir R. Airey, May 23, 1870.

[See Inclosure 3 in No. 25.]

Inclosure 8 in No. 76.

Vice-Consul Francia to Sir R. Airey, May 22, 1870.

[See Inclosure 4 in No. 25.]

Inclosure 9 in No. 76.

Vice-Consul Francia to Sir R. Airey, May 23, 1870.

[See Inclosure 5 in No. 25.]

Inclosure 10 in No. 76.

Mr. Layard to Sir R. Airey.

Sir, *Madrid, May* 23, 1870.

I RECEIVED at a quarter past 10 o'clock last night your Excellency's telegram sent from San Roque at 4·35 P.M., informing me that Messrs. John Bonnell and John Antonio Bonnell, highly respectable British subjects, had been captured and carried off on the previous evening by Spanish brigands about four miles from Gibraltar, in Spanish territory, and that you were in communication with the Spanish authorities at San Roque and Algeciras.

I lost no time in informing the Minister for Foreign Affairs of the contents of your telegram, and late at night his Excellency called upon me to tell me that he had been with the Minister of the Interior and in communication with General Prim, and that telegrams had been at once sent off to the Captain-General of the Province, to the Governor of Cadiz, and to all the local military and civil authorities, directing them to take without any delay any available measures for the release of the captives, and to place themselves, if necessary, in communication with your Excellency for that purpose. His Excellency further assured me that no exertions or expense should be spared on the part of the Spanish Government to effect this object, and your Excellency may rely, I have every reason to think, upon the assurances which Señor Sagasta has given me on their behalf.

I should feel obliged by your Excellency furnishing me with any additional details which may enable me to afford information to the Spanish Government, and which may may be calculated to assist them in the steps they are taking for the liberation of Messrs. Bonnell.

I have, &c.

(Signed) A. H. LAYARD.

Inclosure 11 in No. 76.

Mr. Layard to Sir R. Airey, May 24, 1870.

[See Inclosure 2 in No. 20.]

Inclosure 12 in No. 76.

Sir R. Airey to Mr. Layard, May 25, 1870.

[See Inclosure 1 in No. 28.]

Inclosure 13 in No. 76.

Señor Servert to Sir R. Airey, May 23, 1870.

[See Inclosure 2 in No. 28.]

Inclosure 14 in No. 76.

Sir R. Airey to Mr. Layard, May 26, 1870.

[See Inclosure 1 in No. 33.]

Inclosure 15 in No. 76.

Sir R. Airey to Mr. Layard, May 27, 1870.

[See Inclosure 3 in No. 33.]

Inclosure 16 in No. 76.

Telegrams between Sir R. Airey and Mr. Layard.

(No. 1.)

Sir R. Airey to Mr. Layard, May 22, 1870.

[See No. 1.]

(No. 2.)

Mr. Layard to Sir R. Airey.

Madrid, May 23, 1870.

YOUR telegram received late last night. I have seen Minister of State. Orders have been sent to all authorities, military and civil, to do everything possible for liberation of captives, and to put themselves in communication with you, if necessary. Send me any details which may be of use here for information of Government.

(No. 3.)

Mr. Layard to Sir R. Airey, May 23, 1870.

[See No. 7.]

(No. 4.)

Sir R. Airey to Mr. Layard, May 24, 1870.

[See Inclosure in No. 13.]

(No. 5.)

Mr. Layard to Sir R. Airey.

Madrid, May 24, 1870.

AM without any further information about the Messrs. Bonnell. Has a ransom been asked? Has any agent from the brigands appeared to treat? The Spanish Government are disposed to do everything in their power, but without knowing more I do not know what to suggest.

(No. 6.)

Sir R. Airey to Mr. Layard, May 24, 1870.

[See Inclosure 3 in No. 22.]

(No. 7.)

Mr. Layard to Sir R. Airey, May 24, 1870.

[See No. 11.]

(No. 8.)

Mr. Layard to Sir R. Airey.

Madrid, May 24, 1870.

TELEGRAM has been sent by Spanish Government to Spanish Consul at Gibraltar, telling him to come to an understanding with you, and give safe-conduct to Gabaron if necessary.

The Governor of Cadiz has also been telegraphed to in a like sense

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(No. 9.)

Sir R. Airey to Mr. Layard, May 25, 1870.

[See No. 15.]

(No. 10.)

Sir R. Airey to Mr. Layard.

Gibraltar, May 27, 1870.

UP to this date no intelligence or trace of Messrs. Bonnell.

No. 77.

Mr. Herbert to Mr. Otway.—(Received June 20.)

Sir, *Downing Street, June* 18, 1870.

I AM directed by Earl Granville to transmit to you, for the information of the Earl of Clarendon, and with reference to previous correspondence on the subject, a copy of a despatch from the Governor of Gibraltar, inclosing a copy of one addressed by him to Her Majesty's Minister at Madrid, in regard to the measures adopted for the conveyance of the ransom demanded by the Spanish brigands from the Messrs. Bonnell.

I am, &c.

(Signed) ROBERT G. W. HERBERT.

P.S.—Copies of two further despatches, with inclosures, from Sir R. Airey on this subject are annexed.

R. G. W. H.

Inclosure 1 in No. 77.

Sir R. Airey to Earl Granville.

My Lord, *Gibraltar, June* 5, 1870.

I HAVE the honour to transmit herewith, for your Lordship's information, a copy of a despatch which I have addressed this day to Mr. Layard, Her Majesty's Minister at Madrid, regarding the seizure by Spanish brigands of the Messrs. Bonnell.

I have, &c.
(Signed) RICHARD AIREY.

Inclosure 2 in No. 77.

Sir R. Airey to Mr. Layard, June 5, 1870.

[See Inclosure 4 in No. 57.]

Inclosure 3 in No. 77.

Sir R. Airey to Earl Granville.

My Lord, *Gibraltar, June* 6, 1870.

WITH reference to my despatch of the 5th instant, regarding the recent capture by Spanish brigands of the Messrs. Bonnell, British subjects, in the neighbourhood of Gibraltar, I have the honour to transmit herewith, for your Lordship's information, a copy of the further correspondence on the subject which has taken place between myself and Mr. Layard, Her Majesty's Minister at Madrid, together with a complete series of the telegrams sent and received by me up to this date inclusive.

I have, &c.
(Signed) RICHARD AIREY.

Inclosure 4 in No. 77.

Mr. Layard to Sir R. Airey.

Sir, *Madrid, May* 31, 1870.

I RECEIVED this morning your Excellency's telegram, "Let all remain quite quiet for the present; no pursuit—no molestation." I communicated its contents at once to the Minister for Foreign Affairs, and to Señor de Blas, the Under-Secretary, who is specially charged with this affair. They both assured me that the orders given to the local authorities were strictly in accordance with your wishes.

I have no doubt that your Excellency is in communication with the Governor of Cadiz, who appears to be at San Roque, and that you are made acquainted with the measures he may be taking.

I received last night from the Ministry of Foreign Affairs copies of three telegrams, which I inclose for your Excellency's information. Señor de Blas further stated to me that it was the opinion here that further offers of ransom should not be made from Gibraltar, as the prospect of getting more money might lead the brigands to raise their demands, and render the release of the captives more difficult. I accordingly sent the following telegram to your Excellency this morning:—

"It is thought here that it would be better not to make from Gibraltar any further offers of money to the brigands, which might excite their cupidity, and render it more difficult to deal with them."

I have, &c.
(Signed) A. H. LAYARD.

Inclosure 5 in No. 77.

Telegrams received by the Minister of the Interior from the Governor of Malaga.

[See Inclosure in No. 34.]

Inclosure 6 in No. 77.

Sir. R. Airey to Mr. Layard, June 3, 1870.

[See Inclosure 1 in No. 51.]

Inclosure 7 in No. 77.

Señor Ramos to Señor Montegriffo, May 31, 1870.

[See Inclosure 2 in No. 51.]

Inclosure 8 in No. 77.

Sir R. Airey to Mr. Layard, June 5, 1870.

[See Inclosure 4 in No. 57.]

Inclosure 9 in No. 77.

Telegrams between Sir R. Airey and Mr. Layard.

(No. 11.)

Sir R. Airey to Mr. Layard.

Gibraltar, May 29, 1870, 11 P.M.

NOTHING heard of captives or brigands.

(No. 12.)

Mr. Layard to Sir R. Airey.

Madrid, May 30, 1870, 9·20 A.M.

Can you suggest any other steps for liberation or discovery of captives? Spanish Government are willing to do anything.

(No. 13.)

Sir R. Airey to Mr. Layard.

Gibraltar, May 30, 1870, 4·30 P.M.

Let all remain quite quiet for the present.
No pursuit or molestation.

(No. 14.)

Sir R. Airey to Mr. Layard.

Gibraltar, May 31, 1870, 1·30 P.M.

An emissary from Malaga writes:—" Buenas noticias. Mucho silencio."
So all remains quiet for the present.

(No. 15.)

Mr. Layard to Sir R. Airey.

Madrid, May 31, 1870, 9·45 A.M.

It is thought here that it would be better not to make from Gibraltar any further offers of money to the brigands, which might excite their cupidity and render it more difficult to deal with them.

(No. 16.)

Sir R. Airey to Mr. Layard.

Gibraltar, June 1, 1870.

I have a telegram from Malaga, stating "Mejor noticias. Silencio."
No offer of money to the brigands has been made from here.

(No. 17.)

Sir R. Airey to Mr. Layard.

Gibraltar, June 2, 1870.

Accounts from emissary near Malaga still hopeful and promising.
Captives well, and well cared for.
Question only of time and money.

(No. 18.)

Sir R. Airey to Mr. Layard.

Gibraltar, June 3, 1870, 3·30 P.M.

Received a telegram from Malaga merely reiterating.

(No. 19.)

Sir R. Airey to Mr. Layard.

Gibraltar, June 4, 1870, 1.30 P.M.

Mr. Bonnell, the uncle, arrived at Gibraltar this morning to arrange ransom. Came by steamer from Cadiz. Inaction and secrecy necessary.

(No. 20.)

Sir R. Airey to Mr. Layard.

Gibraltar, June 6, 1870.

The following telegram has just been communicated to me from Cadiz. 6th June, 8·34 A.M.:—

"To Gibraltar Post Office, Manuel Montegriffo.

"Affair marching exceedingly well. John had interview with Chief. Expect we shall get there to-morrow night. Inform his Excellency and the family.—PEDRO."

Inclosure 10 in No. 77.

Sir R. Airey to Earl Granville.

My Lord, *Gibraltar, June* 10, 1870.

IN continuation of my despatch of the 6th instant, inclosing further correspondence regarding the recent capture by Spanish brigands of the Messrs. Bonnell, British subjects, in the neighbourhood of Gibraltar, I have the honour to transmit herewith, for your Lordship's information, copies of the telegrams which have passed between myself and Mr. Layard, Her Majesty's Minister at Madrid, up to this date.

I have, &c.
(Signed) RICHARD AIREY.

Inclosure 11 in No. 77.

Telegrams between Sir R. Airey and Mr. Layard.

(No. 21.)

Sir R. Airey to Mr. Layard.

Gibraltar, June 6, 1870, 5·30 P.M.

I HAVE just received the following telegram, dated Cadiz, June 6th, 2·25 P.M.:—

"Delivering cash to Chief. Captive will arrive here by to-night's train.—RECANO."

(No. 22.)

Sir R. Airey to Mr. Layard.

Gibraltar, June 7, 1870, 5 P.M.

I have the satisfaction to communicate to you the following telegram I have received this moment from Cadiz, dated June 7th, 10·45 A.M.:—

"Captive released.—RECANO."

(No. 23.)

Sir R. Airey to Mr. Layard.

Gibraltar, June 8, 1870, 10 A.M.

The Messrs. Bonnell arrived here last night in the gun-boat "Trinculo" perfectly well.

(No. 24.)

Mr. Layard to Sir R. Airey.

Madrid, June 8, 1870.

Spanish Government informs me that three of the brigands who captured Messrs. Bonnell have been shot, one escaped. Ransom money, or part of it, found in their girdles.

No. 78.

Mr. Hammond to Sir F. Rogers.

Sir, *Foreign Office, June* 21, 1870.

I HAVE laid before the Earl of Clarendon your letter of the 17th instant, and I am to request that you will acquaint Earl Granville that, as suggested by his Lordship, Mr. Layard will be requested to ask the Spanish Government to furnish facts, or at least specify allegations, in support of the statement of Señor Rivero that Gibraltar is a place of refuge for malefactors escaping from the action of the Spanish Tribunals.

I am further to request that you will state to Earl Granville that Lord Clarendon entirely concurs in the propriety of an Extradition Ordinance being published at Gibraltar; and he will request Mr. Layard, as soon as he hears from the Governor that it has been published, to suggest to the Spanish Government to make corresponding provisions respecting criminals escaping from Gibraltar into Spain.

I am, &c.

(Signed) E. HAMMOND.

No. 79.

Mr. Herbert to Mr. Hammond.—(*Received June* 22.)

Sir, *Downing Street, June* 22, 1870.

WITH reference to your letter of the 9th instant suggesting that a searching investigation should be made at Gibraltar into all the circumstances of the recent case of brigandage near that fortress, I am directed by Earl Granville to transmit to you, for the information of the Earl of Clarendon, a copy of a despatch which was addressed by his Lordship to the Governor on the subject, and a copy of the telegram which has been received from Sir R. Airey in reply.

I am to add that Lord Granville has approved by telegram the enactment of an Ordinance for creating a Commission of Inquiry into the case.

I am, &c.

(Signed) ROBERT G. W. HERBERT.

Inclosure 1 in No. 79.

Earl Granville to Sir R. Airey.

Sir, *Downing Street, June* 10, 1870.

WITH reference to former correspondence on the subject of the recent capture of the Messrs. Bonnell of Gibraltar by Spanish brigands, I have to transmit to you a copy of a letter from the Foreign Office, and to request that, in accordance with Lord Clarendon's wish, you will make the most searching investigation into all the circumstances of the case without any avoidable delay, and report to me the result.

I have, &c.

(Signed) GRANVILLE.

Inclosure 2 in No. 79.

Sir R. Airey to Earl Granville.

(Telegraphic.)

RECEIVED despatch of 10th June. In order to carry out your instructions for the most searching investigation into the Bonnell case, am advised to issue a Commission of Inquiry under powers to be created by Ordinance, enabling Commissioners to summon and examine witnesses on oath, to come into force immediately. Please to signify approval or otherwise.

No. 80.

Mr. Herbert Mr. Hammond.—(*Received June* 23.)

Sir, *Downing Street, June* 22, 1870.

I AM directed by Earl Granville to transmit to you, for the Earl of Clarendon's information, with reference to previous correspondence, a copy of a despatch from the Governor of Gibraltar on the subject of the recent assault on two officers of the garrison returning from Algeciras, and of the steps proposed to be taken for the purpose of checking brigandage in the neighbourhood.

I am, &c.

(Signed) ROBERT G. W. HERBERT.

Inclosure 1 in No. 80.

Sir R. Airey to Earl Granville.

My Lord, *Gibraltar, June 15, 1870.*

WITH reference to the telegram I had the honour to forward to your Lordship yesterday, to the following effect,—"Killing Lieutenant Fraser's horse, June 6th, not connected in any way with brigandage. Malefactors in hands of Spanish authorities,"—I beg to transmit herewith, for your Lordship's information, a copy of the Reports which I received from Lieutenants Fraser and Inglis, 71st Highland Light Infantry, on the day following the assault made upon them by two Spaniards on their return from the fair of Algeciras.

The Captain of the guard at the Spanish Lines, upon being informed of the occurrence, immediately dispatched a party of the Guardia Civil in pursuit of the assailants, who were overtaken and arrested at the village of Campamento. One of them attempted to make his escape, and not heeding the command of the Guardia Civil to stop was fired upon and severely wounded. The prisoners were in due course conveyed to San Roque, and there examined before the Alcalde, whose Report has, I believe, been transmitted to Madrid.

From the information I have received, it does not appear that this unjustifiable attack was in any way connected with the brigandage, but it was rather the act of persons in a state of intoxication and acting under the impulse of the moment on being obliged to give way to the two officers on horseback who were coming from an opposite direction.

With reference to this assault and the Bonnell affair, Her Majesty's Minister at Madrid has communicated to me the determination of the Spanish Government to take the severest measures to clear the country of brigands, and its desire that the authorities at Gibraltar should co-operate with the Spanish authorities, and to prevent this fortress becoming a refuge for persons who have escaped from Spanish territory.

I lost no time in conveying to Mr. Layard the assurance of my earnest desire and readiness to co-operate to the fullest extent in my power towards the attainment of the desired ends; and I am happy to find this assurance so completely in accordance with the instructions which your Lordship has been pleased to transmit to me by telegram in cipher, dated Monday 13, and to the following effect:—"Co-operate as far as you legally can with the Spanish Government to put an end to the brigandage. Take care that, if possible, accomplices within the fortress are brought to justice."

I may add, that up to the present moment no person in Gibraltar, whether native or alien, has been denounced as an accomplice of the brigands who captured the Messrs. Bonnell.

I have, &c.
(Signed) RICHARD AIREY.

Inclosure 2 in No. 80.

Lieutenant Fraser to the Assistant Adjutant-General.

Sir, *Gibraltar, June 7, 1870.*

I HAVE the honour to report, for the information of his Excellency Lieutenant-General Commanding, that about 9·40 P.M. last night, I was returning on horseback from Algeciras, about 100 yards in advance of Lieutenant Inglis, when between the road turning off to Compamento and the Spanish Lines, I passed two men who moved aside to allow me to pass, and they made no remark.

Immediately afterwards I heard a cry from Lieutenant Inglis, and on turning back I met him running, pursued by two men, and saw his right leg covered with blood. He jumped up behind me on my horse, and we galloped to the Spanish Lines, where we reported what had occurred.

Lieutenant Inglis informed me that the horse on which he was riding had been stabbed, and had fallen down dead.

I have, &c.
(Signed) HUGH FRASER.

Inclosure 3 in No. 80.

Lieutenant Inglis to the Assistant Adjutant-Gen...

Sir, *Gibraltar, June 7*, 1870.

I HAVE the honour to report, for the information of his Excellency the Lieutenan General commanding, that I was yesterday returning from Algeciras, riding, about 9·40 P.M.

When between the road leading to San Roque and the Spanish lines I met two men, one of whom, without any remark, stabbed my horse on the off-side; the horse staggered some few yards, and fell on his head and died.

I then, for the first time, saw the blood flowing from a wound in his shoulder.

The two men rushed at me; I called out to Lieutenant Fraser, who was about a hundred yards ahead of me, and ran after him, still pursued by the two men. On my way I saw a Spanish sentry, to whom I endeavoured to explain the occurrence. He did not seem to understand me, and Lieutenant Fraser coming up I jumped up behind him on his horse, and galloped to the Spanish lines, where we reported the matter to the Commander of the Spanish Guard.

I have, &c.

(Signed) JAMES A. S. INGLIS.

CORRESPONDENCE respecting the Capture of Messrs. John and John Antonio Bonnell by Spanish Brigands, near Gibraltar: 1870.

BOMBAY BRANCH
OF THE
Royal Asiatic Society.
CLASS

Presented to the House of Commons by Command of Her Majesty, in pursuance of their Address dated June 20, 1870.

LONDON:
PRINTED BY HARRISON AND SONS.

MALTA.

RETURN to an Address of the Honourable The House of Commons, dated 15 March 1869;—*for*,

"COPIES of DESPATCHES of Earl *Grey*, addressed to the Right Honourable Mr. *More O'Ferrall*, in the Years 1847, 1848, and 1849, relative to the Establishment of a COUNCIL of GOVERNMENT and LEGISLATIVE CHAMBER in the Island of *Malta*:"

"Of REPORTS addressed to the Secretary of State for the Colonies by the late Mr. *H. Lushington*, in the Years 1847 and 1848, on the Establishment of MUNICIPAL INSTITUTIONS in the same Island:"

"Of CORRESPONDENCE between Earl *Grey* and the Right Honourable Mr. *More O'Ferrall*, in the Year 1850, on the PROCEEDINGS of the COUNCIL of the said Island:"

"And, of CORRESPONDENCE, in the Year 1860, between the Duke of *Newcastle* and Sir *J. G. Le Marchant*, relative to the Combination of the Civil and Military Administration under the same Head."

Colonial Office,
13 May 1869.

W. MONSELL.

(Mr. Torrens.)

Ordered, by The House of Commons, *to be Printed*,
27 *May* 1869.

BOMBAY BRANCH
OF THE
Royal Asiatic Society.
CLASS
217.

SCHEDULE.

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(No. 2.)

Copy of a DESPATCH from the Right Hon. the Earl *Grey* to Governor the Right Hon. *R. More O'Ferrall*.

Right Hon. the Earl Grey to Governor the Right Hon. R. More O'Ferrall. 26 Nov. 1847.

Sir, Downing-street, 26 November 1847.

WITH reference to my Despatch of the 29th ultimo, No. 2, transmitting to you Her Majesty's commission, and the accompanying instructions, by which you were appointed Civil Governor of the Island of Malta and its Dependencies, it is now my duty to convey to you the following explanation of the objects with a view to which Her Majesty has been pleased to confer upon you this important office.

You are aware that, in consequence of complaints having been addressed to the Ministers of the Crown by the inhabitants of Malta, of defects in their institutions, and in the general administration of their internal government, a commission of inquiry was appointed in 1836, to proceed to Malta to collect such information as might enable Her Majesty's advisers to supply a remedy to their complaints, and thereby promote the peace and contentment of Her Majesty's faithful subjects in Malta, which their devotion to Her Majesty and their well-tried loyalty to the Crown so fully merit.

The results of that commission not having proved so satisfactory as had been generally anticipated, a very general feeling has been expressed in Malta in favour of no longer placing in the same hands the civil government of the island and the military command of the garrison, in order that the Governor may be enabled to devote a larger share of time and attention to the civil affairs of the island.

Her Majesty, therefore, being anxious to consult the just and reasonable wishes of her faithful subjects in Malta, whom she regards as having peculiar claims upon her consideration, from their being necessarily precluded from representative institutions common to so large a proportion of Her subjects, has been graciously pleased to accede to their prayer for the appointment of a Civil Governor.

In recommending to Her Majesty that you, Sir, should be selected to hold that appointment, the advisers of the Crown desire to afford to the Maltese people a practical proof that religious opinions are no disqualification from offices of great trust and importance under the Crown, and that loyalty to the Sovereign

and attachment to British interests will ensure to all classes of Her Majesty's subjects, in every part of Her Dominions, an equal share of consideration and confidence.

Her Majesty is deeply sensible of the noble confidence reposed by the Maltese people in the honour and good faith of Great Britain at the period when, having nearly achieved their independence by their own gallant efforts, they placed their dearest interests almost unconditionally at the disposal of Her Royal predecessor.

Her Majesty responds to that confidence, and desires that all the institutions, civil and religious, to which the Maltese are attached, and which they have so long enjoyed, may be fostered and preserved, subject to such amendments and improvements as time and altered circumstances may render necessary, in concurrence with the feelings and opinions of the people for whose benefit they are intended. You will bear in mind that an additional responsibility attaches to the Government of an unrepresented people, and renders it more incumbent on those who administer their affairs, to supply so far as possible the advantages to be derived from direct representation by an attentive observation of public opinion.

It will be an essential part of your duty to promote harmony and peace between all classes of Her Majesty's subjects at Malta, and to enforce, by example and precept, a general toleration, the foundation of religious liberty, which belongs of right to all the subjects of Her Majesty; distinguishing between the unrestrained freedom of public worship for every sect, and the license of disturbing established religious institutions, under any pretext whatsoever.

On your arrival at Malta you will communicate this Despatch, or its substance, to your Council, and impress upon them and the subordinate officers of the Government, whether English or Maltese, that in administering the affairs of Malta, they are the servants of the Crown, paid by the Maltese people for services to be rendered to the Colony; and you will enjoin, and, if necessary, enforce zeal in the discharge of their several duties, and a ready attention to the representations and complaints of all classes of the people.

By thus making known the intentions of Her Majesty, and the views of Her Majesty's advisers, in recommending so important a change in the mode of administering the affairs of Malta, I trust I may facilitate your efforts, and obtain for your Government the support of the Maltese people in the gradual correction of any abuses which may now exist, and may interfere with their enjoying that full measure of prosperity and happiness which Her Majesty so earnestly desires for them.

I have, &c.
(signed) *Grey*.

(Confidential).

Right Hon. the Earl Grey to Governor the Right Hon. R. More O'Ferrall. 19 May 1848.

COPY of a DESPATCH from the Right Hon. the Earl *Grey* to Governor the Right Hon. *R. More O'Ferrall.*

Sir, Downing-street, 19 May 1848.

I HAVE to acknowledge the receipt of your Despatch, dated April, and marked "Confidential," in which you propose the names of 15 gentlemen, all or some of whom you are desirous of introducing to the Council of Government, at Malta. I am entirely disposed to promote your wishes in that respect; but as I deem it, nevertheless, desirable to give you an opportunity of considering maturely the mode in which I propose to accomplish that object, I transmit to you herewith the draft of an instruction on the subject, which it is intended to submit to the Queen.

You will perceive that it is proposed,—

1st. To retain the present name or title of the Council.

2nd. To allow the present members to retain their seats.

3rd. To empower the Queen to appoint as many members as may be thought proper; and,

4th. To empower you to appoint a certain number of persons to the Council provisionally, and subject to Her Majesty's pleasure, or to confirmation or disallowance.

But

But I have not thought it desirable to make any other alterations in the constitution of that body, without being made acquainted with your wishes and views on the subject.

The points to which I would wish more particularly to call your attention, as deserving of consideration, are the title of the Council, the number of members to form a quorum, and the relative proportions of the official and unofficial members.

The title of the Council is not a matter which has no significance.

Your Council partakes of the double character of an executive and legislative body, qualified to advise with you on matters of government, and to co-operate with you in making laws; but if its title is to be altered to that of a Legislative Council, it would become necessary to curtail its authority to advise you on general subjects.

With regard to the quorum, it appears desirable that the component number should be enlarged.

The last of the topics to which I have adverted involves some delicate considerations.

Desirous as I am that the general character of the new Council should inspire the people of Malta with the fullest confidence in the power and capacity of that body to promote the public welfare, it must, nevertheless, be borne in mind that in a great military station of the highest importance like Malta, the power of the executive authority must be carefully preserved and strengthened by every fair and honest means; and it is in this point of view that I look to the necessity of securing to the Governor the certain support of a given number of members of the Council, by ensuring the appointment of a fixed number of official persons. But the terms of your confidential Despatch do not make me certain whether you wish to extend the number of the Council by adding all the 15 gentlemen whom you have named, or whether you wish for a power of selection among them. In the former case the total number of the Council will be 22. There will then be only four official to 18 unofficial members. This unusual proportion requires some reason to justify it.

I wish you, therefore, to report whether, in addition to the unofficial members whose names you may wish to add to the Council, the holders of some more offices cannot be conveniently appointed to it.

I have, &c.
(signed) *Grey.*

(No. 156.)

COPY of a DESPATCH from the Right Honourable the Earl *Grey* to Governor the Right Honourable *R. More O'Ferrall.*

Right Hon. the Earl Grey to Governor the Right Hon. R. More O'Ferrall. 22 May 1849.

Sir, Downing-street, 22 May 1849.

1. I HAVE now to transmit to you those instruments which have appeared necessary in order to carry into effect the changes in the Legislature and Government of Malta, which, after considerable deliberation and discussion, were suggested by you in your separate Despatch of 1st February last. Some time has necessarily been devoted, in the first place, to the consideration of details; and, secondly, to the necessary forms through which the instruments in question had to pass.

2. They consist of Letters Patent under the great seal, constituting a charter of government, revoking as much as is necessary of your former commission, and establishing in lieu of the Council provided for by the repealed provision, a Council of Government to be composed of a certain number of members both official and representative. These are accompanied by instructions, which specify in more detail that portion of the arrangements which is to be considered of a less fundamental character.

3. As these instruments, while they carry into execution the substance of your recommendation, nevertheless vary from them in some particulars and omit others, it will be convenient that I should proceed to recapitulate the various heads of your Despatch above referred to, and show in what manner they

they are embodied in the instruments in question, or for what reason they have been departed from.

4. In paragraph 17 of your Despatch, you propose the establishment of a "Legislative and Municipal" Council, to be composed of members to be appointed in the manner therein described. For reasons which will hereafter appear more clearly, it does not appear to me that the Council thus established can properly be termed "municipal," and, considering the nature of its functions, it has been thought that the more general title of "Council of Government" would be more appropriate than that of "Legislative Council."

5. The composition of the official portion of this Council, in the manner pointed out in paragraphs 18 and 19, is provided for by the "Letters Patent," in conjunction with the first clause of the instructions.

6. The alteration which you suggest in paragraph 20, in the event of the functions of governor and commander of the troops being united in the same person, would be best provided for by a supplementary instruction, which might be issued on such an occasion.

7. The scheme for the appointment of municipal committees, contained in paragraphs 21, 22, and 23, it has been thought best, after much consideration, not to embody in the present instruments. While I concur with you in regarding some such arrangement as likely to prove of service to the Island, it has not appeared to me to be either necessary or advisable to create institutions, so novel in character, by positive clauses in the Royal Charter. When the Council is constituted with full legislative powers, you will have no real difficulty in creating by enactments or otherwise any such bodies, whether committees or commissions, as public expediency may require for the purposes which you have enumerated; and that bodies thus created would, probably, possess more of the public confidence than if they were established by an authority which can be but imperfectly acquainted with the minute details of government in Malta.

8. It has occurred to me also that the functions which you would attribute to these committees, namely, of investigating accounts, enforcing the rules of public establishments, reporting abuses, and recommending improvements, are not such as, of necessity, require that the members of the bodies by which they are to be performed should also be members of the legislature. Experience may not improbably point out that these functions are likely to be better performed by independent authorities, acting under commission from yourself, of which the official members need not necessarily be members of the Council of Government. I think it may probably be advisable that the elected members of the Council of Government should by virtue of their election be members of such committees or commissions, but the reasons in favour of this arrangement do not of necessity apply to the official members of that body. I am of opinion that if these Boards were to sit when the Council of Government has been prorogued, that they should rather be styled boards of commissioners than committees, since it would be objectionable on constitutional grounds to sanction the sitting of committees of the Council of Government during its prorogation. With the advice of the law officers, it will be proper that you should carefully define the functions of these boards and their constitution, either by an ordinance to be passed for that purpose, or by the terms of the commission by which they may be appointed.

9. The civil list is fixed, as recommended by yourself in paragraph 24, power being given to the Governor and Council to vary it, but only by the enactment of a law, such law having a suspending clause so as to render the Sovereign's assent necessary to its coming into operation.

10. There is no clause providing that in time of war the functions of the Council should be suspended, on the responsibility of the Governor, as proposed by you in the same paragraph. This appears, in the first place, difficult, inasmuch as it would be necessary to specify what is meant by the term "war," which certainly could not include all hostilities in which the United Kingdom might be engaged in any quarter, and also unnecessary, inasmuch as the Governor has the power at any time to dissolve the Council, while, if still more stringent

stringent measures were required, the Crown reserves to itself power, by the last clause of the letters patent, to repeal, alter, and amend them.

11. The clause proposed in paragraph 25 appears unnecessary, and is therefore omitted. The Council would, as a matter of course, possess the power of addressing the Crown for the purposes therein specified.

12. Paragraph 26 of your Despatch is embodied in the instructions. But the restriction on petitions, in paragraph 27, appears unadvisable, and is omitted. The provision of paragraph 28 is rendered somewhat more comprehensive, empowering the Council to call on the judges for their assistance in general terms.

13. The qualification of the electors, as specified in paragraph 30 of your Despatch, is provided for in the letters patent in more general language, but intended exactly to carry into effect your own suggestions; namely, that of conferring the franchise on those who are qualified by property to serve on juries, including those who are exempted from such service by age or profession, but excluding (by implication) such as are disqualified for the personal reasons specified in section 9 of the Jury Act.

14. But it has been thought unadvisable, or I might rather say impossible, to introduce into an instrument necessarily of so general a nature as a charter, the particulars of the time and manner of the future elections, contained in paragraphs 31 to 34. Nor, on the other hand, would it be according to precedent or convenience to insert them in the Governor's instructions. Inasmuch, therefore, as you consider it not expedient to frame a legislative measure for these purposes with the aid of your present Council, it has been thought better that you should have the power conferred on you to effect the same object by proclamation. But you will easily understand that such a power ought to be exercised, if possible, *pro hâc vice* only, so as to provide for the election of the members of the first Council. To clear away all doubts on this subject, power is expressly given to the Council of Government, when constituted, to repeal or vary the provisions of such proclamation; and it will, no doubt, be one of your first objects to pass an election law, in framing which the experience acquired by the first elections under your proclamation may probably assist you.

15. I agree in the view which you have expressed in paragraph 40, that it is advisable that the Governor should be a member and the president of the Council of Government; and he is accordingly so constituted. But I think it is also desirable that although himself a member of the body, he should retain, as distinct from that function, the office of a separate branch of the legislature. It is, therefore, expressly provided that no ordinance shall be valid without his assent.

16. The particulars which I have now enumerated, appear to embrace all the material points in which the scheme previously propounded by yourself may be considered as modified in the execution. The modifications are in reality slight, and none of them, I trust, is calculated in any way to abridge or impede the great object of the measure, the conveying to Her Majesty's Maltese subjects a substantial share of power, through their representatives, in the preparation and enactment of those laws by which they are to be governed. Participating, as I do, in the opinions which you have so fully expressed as to the advantages to be attained by the gradual introduction of self-government, I look forward to the experiment now about to be tried with hopeful anticipations; and I shall regard it as one of the happiest objects which it has been placed in my power to assist in achieving, if the privileges which Her Majesty has now conferred on the people of Malta at my advice, and on your suggestion, shall prove not only beneficial in promoting the immediate object of good legislation, but fruitful also in greater and more important results in fostering the spirit of social improvement, together with that of resistance to rash and violent innovations.

I have, &c.
(signed) *Grey.*

(No. 185.)

Right Hon. the Earl Grey to Governor the Right Hon. R. More O'Ferrall. 16 August 1849.

COPY of a DESPATCH from the Right Honourable the Earl *Grey* to Governor the Right Honourable *R. M. O'Ferrall.*

Sir, Downing-street, 16 August 1849.

I HAVE to acknowledge the receipt of your Despatch of 7th ultimo, No. 78, transmitting a copy of a proclamation, intituled "A Law to regulate and appoint the Election of Members to serve in the Council of Government of Malta," bearing date 7th July 1849; and I have to observe that, by the 7th section of the warrant for preparing letters patent under the great seal to reconstitute the Council of Malta, dated 4th May 1849, it is provided that the election should be conducted in the manner and form prescribed by the Governor's proclamation, subject only to Her Majesty's right of disallowance. It is not, therefore, necessary that this proclamation should be confirmed by Her Majesty.

I have, &c.
(signed) *Grey.*

REPORTS addressed to the Secretary of State for the Colonies by the late Mr. *H. Lushington*, in the Years 1847 and 1848, on the Establishment of MUNICIPAL INSTITUTIONS.

Remarks on the Proposal to form a Legislative Council.

REMARKS on the Proposal to form a LEGISLATIVE COUNCIL, contained in His Excellency the Governor's Despatch to Earl *Grey* of 10 July 1848.

THE proposal submitted in this letter raises two main points for consideration; one whether it is desirable to bestow on the Maltese a direct share in the government of the island through the medium of something in the nature of an elective system; the other whether, supposing this question to be affirmatively decided, the present scheme is well conceived for its purpose. I leave the second point, that which involves an examination of the detail of the scheme, until the first has been considered.

The position of the Maltese is this:—They or a part of them have expressed a wish for a representative legislative body: they have also expressed a wish for elective municipal institutions. No hope has been hitherto held out to them of the first, but, it being considered as nearly out of the question, they have received something like a promise of the second.

I do not think, however, that the hopes held out to them of municipal institutions need interfere with the granting something like representation *instead*, if that course were considered preferable; for I believe their feeling would be in favour of the higher boon, and that they would accept it as more than the fulfilment of the promise of the other. As between the two courses, then, the question may be considered an open one. If nothing were done in either direction, the Maltese would, after the expressions which have been used, have just ground for some complaint. Are elective municipal institutions, then, desirable in Malta?

Unless such institutions involved a greater amount of independent power than is generally implied by the name, I do not think that they would be dangerous, except from the discontent which might be created by their working badly and expensively; I am inclined, however, to doubt whether they would work otherwise. There is a great difference between the circumstances of Malta and those of other countries in which municipal institutions exist; as (to take the nearest example) Italy and France. In the greater part of Italy the prevalent system is a modification of the French system; of which the object may be stated to be the combination of a widespread system of local government with the most perfect centralization. These institutions are a machinery constructed

at

at least as much to secure centralised inspection as local independence, and in practice the first principle has hitherto swallowed up the last. In Malta, centralisation is unavoidable, not only from the construction of the existing institutions, but from the very nature of the case. The size of the country makes a great subdivision of powers difficult to bring about, and certain to be injurious if effected. The French system presupposes a large country, and a great variety of interests to be subjected to uniform central control; in Malta the tendency of everything, morally and materially, is towards the Government. Unity is more natural than subdivision; and I do not think it improbable that the creation of separate self-governing communities would have the effect of increasing the complication, and therefore the expense of the machinery of government. A department of public works, for instance, is essentially connected with the government of Malta; it would be impossible to shift it more than partially upon the municipal bodies, did such exist; and the result of a partial transfer would be to create a double system of administration, and substitute to the same extent weak and therefore wasteful action for singleness and vigour. And without denying that in Malta there is a real wish for the admission of something popular into their institutions, I confidently assert the absence of that democratic enthusiasm which will bear up contentedly against the results of an expensive experiment.

The difficulties pointed out in his Excellency's letter, paragraph 6 to 11 are perhaps capable of being disregarded, should it appear that a paramount expediency demands the granting of municipal institutions, but they are considerable. Voluntary contribution to a fund for parochial purposes has been suggested as the basis of a constituency; but it is most probable that any scheme based on this would fall to the ground, or rather never come into action at all, from the universal unwillingness of the people to contribute. A constituency however based upon rent might probably be created with more or less trouble, the question which would create practical difficulty would be, what are to be the funds administered by the municipalities. To expect them to raise any voluntary additional taxation for the purpose of local improvements is out of the question. If taxation to the average amount at present expended upon these local objects were remitted, the result would probably be, not that the same sum would be raised by local taxation and better spent, or the same objects accomplished for less expenditure, but that a much less sum than the present would be raised with more feeling of hardship and expended less to the general satisfaction. The people are so much in the habit of looking to the Government for the initiative of every step to be taken, that it would be long before they appreciated the boon, even coupled with a slight diminution of duties on imports, of being thrown upon their own resources for any local improvements or repairs.

There remains the course noticed in his Excellency's letter; that of placing in the hands of the municipal bodies a portion of the revenue. It is unnecessary to observe how essentially different such a course would be from that of creating self-taxing communities. It is almost incompatible with the principle of municipal independence to have the whole fund administered by the local authority come from the public revenue. It reduces the pecuniary interest of the municipal body simply to obtaining from the Government as large a share of the public money as it can. In the administration of these funds, moreover, the interference of the Government would be very generally necessary, not merely as Government, but from its local interests as the proprietors of one-third of the property of the island; and this would much increase the difficulty of giving to municipal bodies anything like independent action.

On the whole, I am disposed to conclude from these considerations, that the construction of municipal bodies in Malta would result, in all probability, in much disappointment, and that an attempt to remodel the Council may be preferable in itself; and, though apparently bolder, not less secure.

Assuming, then, that a reconstitution of the Council is desirable, I proceed to consider the plan proposed for that object. The question between a more numerous Council, nominated as proposed by his Excellency in his previous Despatch, and one admitting of an admixture of election, is already disposed of. If the Maltese are to have either municipal institutions or some share in the election of their Legislative Council, the refusal of the one implies the concession of the other. But even otherwise, as between the two proposed Councils, I should prefer the plan which introduces some elective members to that which increases

the number of nominated members. The mere increase of number would be rather a disadvantage, unless it imparted an increase of popular confidence. The change might be acceptable for a time, but when it was found by experience (as I think it will be, under any circumstances) that the new Council produced much the same practical results as the old, the present feeling would recur, and the demand for an elective Council revive. Nor do I think that a Council so composed in part of elected members would be less manageable than one of the same number wholly nominated. It is a real advantage to every Government to be acquainted with the views, right or wrong, of different classes of the community. Nominated members, with whatever judgment selected, would produce this advantage imperfectly, compared with elected ones. A clear official majority would be a security against any merely factious opposition; but it may be hoped that it will not generally be difficult for a government such as Malta is likely to have, to satisfy the elected part of the Council of the fairness of its intentions. I do not, therefore, apprehend any risk from the adoption of the elective principle, so far as a minority of the Council is concerned; and if no risk be apprehended, the advantages on the other side are obvious.

Then arises the question, in the first place, who are to be the electors? On this subject I entirely concur with his Excellency as to the inexpediency of agitating the minds of the mass of a simple people with the idea of a direct share in the Government, and the corrupting machinery of an elective system. The lower classes in the cities might, without doubt, be excited to demand a franchise which they are scarcely fit to exercise; the inhabitants of the country would certainly, for the present, feel it rather as a burden than a privilege.

The classes to which it is proposed to give the power of electing members of Council undoubtedly embrace a very large proportion of those who would attach much meaning or value to the power.*

With regard to one of these, the class so styled of merchants, there may be considerable difficulty in defining those who are, to the exclusion of others, entitled to the appellation. A great number of those generally called so sell by retail, and many shopkeepers are equal in property and position to others known in common parlance as merchants. This, however, is a difficulty of detail, which can of course be overcome should the scheme be adopted in its main features.

With reference, however, to the mode in which it is proposed that these classes should elect members, it appears to me that a scheme based on the principle of a separate representation of each class, would be greatly preferable to that proposed at present, by which all the constituent classes are fused into one constituency to elect the whole number of members. The inevitable consequence of such a mode of election, wherever adopted, is, that the minority is swamped, and the members returned represent only the majority. And where a constituency is based, like the one proposed, upon selected classes, in the hope that the representation of such classes will afford something like representation of the people, it appears to me peculiarly objectionable to nullify the vote of the less numerous classes by combining them with the more numerous. Nearly two-fifths of the electors, according to the scale drawn out, belong to one class, the clergy; nearly two-fifths to another, the landowners. This class, including a very large proportion of small proprietors, occupying, both in respect of society and education, an entirely different position from the professional classes, advocates, physicians, merchants, &c., would have twice the weight of all of them put together, and would be, moreover, mainly under the influence of the first-named class, the clergy. It is known from experience how such a system would work. The clergy would act generally as a body; they would agree on their six or eight candidates, the great bulk of the small proprietors would infallibly support their nomination, and the list of candidates supported by the clergy would inevitably be

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* The six electoral bodies proposed are—

	Voters.
1. The proprietors of land	813
2. The secular clergy	854
3. The lawyers	149
4. The merchants	141
5. The medical profession	130
6. The notaries and attorneys	158

Of whom about 150 may be calculated as belonging to Gozo.

be the list carried, though it might entirely exclude the men judged fittest to represent them by the lawyers, the physicians, and the mercantile body of Malta. Neither the comparative intelligence and education of the bulk of the two mor- numerous classes, nor the influence actually exercised by them in secular mattere over the public mind, would justify such a result. The complaints of the overs powered classes would be loud and just; they would be the first to direct public attention to the restricted nature of the franchise, and the discontent occasioned by the working of the measure in this respect would not improbably lead either to its being altogether thrown aside, or to a very large addition to the body of voters to restore the balance.

If, on the other hand, the classes were permitted to elect each its representative, the prevalence of exclusive views would be avoided, and the Government would have the chance of deriving real information on the separate interests brought within its notice. I am aware of the usual objections to a representation founded on classes; but in Malta I think such objections less than usually applicable. The classes to which it is proposed to give the power of electing members have no interests opposed to those of any great portion of the people, they may be taken as fairly representing the wishes and feelings of the more educated portion; and, were it likely that a question could arise in which their interests stood in opposition to the general interests of Malta, the government has, by the proposed composition of the Council, the fullest power of protecting the inhabitants in general from anything like class legislation. It may be observed that a representation of classes would give something corresponding to a territorial division, without the inconveniences of one; the professions generally representing the city interests, the clergy and landowners the rural.

The objection to this plan arising from the disparity of numbers in the different classes might be partly obviated by attaching the procurators and notaries to the advocates, and giving two members to the clergy; still leaving the number to be elected six, thus:

Clergy - - -	2	Advocates and procurators,	1
Landowners - - -	1	Merchants - - - -	1
Physicians - - -	1		

Or if this be thought still to leave the disproportion too great, another arrangement might be proposed, thus:

Clergy - - - - - - - -	2
Landowners - - - - - - -	2
Lay professions, law and medicine - - -	2
Merchants - - - - - - -	1
	7

Even were the merchants combined with the professions for the purpose of electing two members, thus leaving the number six, their position would be better than in the proposed scheme. The principle for which I contend is not so much that of giving each class an equal share in the representation, as that of giving it a share which it will feel to be real, and not complain of as merely apparent.

If all classes were to elect together, I would then submit that it will become imperatively necessary, as far as the clergy and landowners are concerned, to devise some means of limiting the franchise to the higher and better educated portion of the clergy, and the wealthier of the landowners; but I think it would be better to leave the constituency on the simple basis of clerical orders in one case, and the possession of land in the other, giving to each the power of electing its separate member or members. Of course, no class should be bound to elect exclusively from itself; the advocates might elect a landowner if they wished, the physicians a lawyer, and so on.

Were a scheme of this nature adopted, there are several descriptions of persons who might perhaps be advantageously added to one or the other proposed divisions of the constituency. It is very common in such Continental states as have adopted the principle of election by a limited constituency to give the franchise by other tests than that of property to men of literary position, &c. I would propose to give it in Malta to all retired officers of the Malta Fencibles, indeed

to all who have served Her Majesty in Army or Navy in commissioned rank; these might vote with the class of landowners. I would also propose to give it to all who should have passed with certain credit through the highest classes of the Lyceum, and attach these to the advocates' constituency; as also all professors in the Lyceum not otherwise qualified as belonging to any of the other classes. Other equally unobjectionable tests might perhaps be found, none adding more than a few to the constituency; but those few would be among the fittest of all its members, and some distinction would thus be attached to the possession of the franchise.

For Gozo, if it be considered necessary to give it a separate representation from that of Malta, I would permit the bodies to vote together, simply because it cannot have a representative for each, and the collective number would be very small. The population of Gozo being to that of Malta in the proportion of 16 to 100, and there being no large city, two out of eight, or one-fourth of the representation, appears too large a share for that island. I would either give them one, to be elected by all together, or if two, then one to be elected by the clergy and landowners, the other by all other professions.

On the more detailed portions of the scheme, there is less reason to remark, as these must in any case be left for after consideration. The division of the council into committees, as proposed by his Excellency, with a distribution among them of the superintendence of those portions of the duties of Government which are more strictly municipal, appears a very feasible and desirable step. That it gives to the members of a so-called legislative council a share of executive power, is perhaps rather an objection to the name of the council than to the measure itself. The number of 18 is, perhaps, too great; the necessity for it might be obviated by a slight change in the arrangement of the committee, and if Gozo had only one representative and Malta six, there might be omitted on the other side at least one of the proposed official members. I would observe that the increase of Maltese official members would probably not be in itself acceptable to the Maltese; and that an addition of three such members would be preferable to an addition of four.

One proposal of considerable importance remains to be considered: it is that at par. 24th,—

"That the Governor should select three members to be his council."

This appears to me objectionable. The advice of all the official members of council is necessarily at the command of the Governor when he wishes to ask for it; and each head of a department, so far as his own department is concerned, occupies a responsible position, but responsible not to individual members of the council, but to his official superiors, to the Governors, and to the Home Government. The position of one, or two, or three *elected* members of the council, selected by the governor to form such a cabinet as that proposed, would be difficult and anomalous, especially towards the head of each department. Without responsibility, they would have to judge those who were responsible not in their capacity of legislators, nor of an executive council, but simply of privy council to the Governor. Such a system, worked by some hands, would lead to the reality worked by any hands, to the suspicion of favouritism; above all, in Malta, where all its effects would be aggravated by a natural tendency to suspicion and the characteristic jealousies of a small community.

These remarks, drawn up in accordance with his Excellency the Governor's directions, are submitted with much respect to his judgment.

Valetta, 10 July 1848. (signed) *Henry Lushington.*

THE great questions which have agitated Italy for the last six months have for the time diminished the apparent importance to Italians of many subjects which were before matters of serious and universal interest. Free constitutions have taken the place in men's minds of improved municipalities; and of late both have been for the moment subordinate to the hopes and struggle for Italian independence.

But in the end of the year 1847 no subject was more generally interesting to the writers and readers of the newly-emancipated Italian press, than that of municipal government. The necessity for some change in the existing systems had

had been loudly and simultaneously urged in nearly every Italian state; and various remedies for the abuses complained of suggested or promised. Under these circumstances, the chief difficulty was to obtain clear information as to the existing laws and practices, a difficulty varying according to the aspect in which the subject was regarded by the partisans of reform in the different states. Amid the construction of new theories of municipalities, the revival of old claims of the importance historically due to them, the attempt to define their exact bearings on the individual and the state, with the debateable ground whether and how far the municipal system ought to be a political engine in the hands of the people, as it had hitherto been in the hands of the government, the details of the existing system were hard to be discovered. In Naples, where there was not the same freedom of utterance, or anticipations, and consequently no temptation for speculation on the subject of municipalities, it was much easier to obtain exact information. The matters which form the actual objects of local government must be in kind much the same in all countries possessing any local institutions distinguishable from the political machinery of the state.

All matters which, like the maintenance of roads, bridges, buildings, establishments, &c. (as well as the distribution of the local taxation required for these objects), in which the members of the local community are more directly interested than any non-resident can be, all affairs in which neglect or mismanagement is most immediately felt by them, form the natural subjects of local legislation and administration.

But the power exerted by every local community must be subordinate to the power of the state; the self-government of the parish or commune must reconcile itself with the supremacy of the legislature. Every municipal system (properly so called) must therefore contain the two opposite principles of centralization and local independence; and the predominating element will determine the character of each system. The local institutions may be the mere machinery by which the force of the central Government is exerted; or the authorities may be, within the limits of their proper functions, almost as independent as if there were no government over them. France supplies an example, to a great extent, of the one tendency; England, and still more, I believe, the United States, of the other. The Italian systems lie between the two, and their history will furnish instances of each of these principles having been the original spring of action; but it supplies no instance of a just equilibrium between the two; in some cases the machinery is cumbrous and incomplete, and therefore inefficient; in others, as in Naples, the most elaborate construction is found quite compatible with the most scandalous administration. Generally speaking, the model of centralization given by France has been adopted; by necessity, during French occupation, and subsequently, to a great extent, by choice.

The systems described are four: those of Piedmont, Tuscany, the Papal States, and the Continental Neapolitan dominions.

The kingdom of Piedmont is territorially distributed into divisions, and these into provinces, of which there are 39, containing altogether more than 2,700 communes. There is another distribution into "Mandamenti," with reference solely to the judicial system, and not corresponding with the boundaries of the territorial divisions.

Edict of 1775.

The foundation of the present municipal system for the Sardinian States was a royal edict of Victor Amadeus in 1775. This law entrusted the administration of the property and affairs of each commune to a local council, under the immediate superintendence of the intendant, the representative of the government and chief executive authority in each province.

Communal councils.

This communal council consisted of seven, five, or three members, according to the importance of the commune. It was presided over by the eldest member, who bore the title of syndic; after six months' tenure of this office he resigned his seat in the council, and was not re-eligible for three years. The vacancy was filled up by a qualified person elected by the council, subject to the approbation of the Intendant of the Province.

Qualifications.

The chief qualifications were residence; being above 25 years of age; not having any lawsuits with, or being a debtor to, the commune; having no close family connection with either the officers or trustees of the commune, or with individuals or establishments at law with it. In the cities the council was to comprehend members from each of the two classes of nobles and citizens.

Aggiunti.

From the list of those qualified there were also selected by the council, six,

four, or two names, according to the class of the commune, to act as "Aggiunti," or extraordinary councillors. These persons were to be approved of by the intendant, and were called in by him on all cases of importance, such as the formation of the yearly budget, the audit of accounts, distribution of rates, &c.

Secretary.

The council also elected its own secretary, subject to the approbation of the intendant; for this office the qualification of being a practising notary was added to those required from the ordinary councillors. His office implied his being present at all meetings; reporting the proceedings; taking care of the archives; forming the financial statements of the commune; and not unfrequently he performed the duties of "catastaro," or registrar. His salary was fixed by the council, subject to the approbation of the intendant.

Exemptions from office.

No person might refuse any of the public offices, under penalties to be fixed by the intendant. There were, however, special exemptions, as, for instance, the being 70 years of age; having 12 children; having served the state for a certain term of years, or being in the actual exercise of particular kinds of business.

No act of the council was to be put into execution without being countersigned by the intendant, except in cases of most absolute necessity, and in these cases the council were personally responsible for the expenses incurred.

Duties of the council.

Under these restrictions the management of all the public property of the commune was confided to the council. They were charged to let by public auction all the cultivable land, to sell to the best bidder all the cuttings of timber or underwood; to superintend the public tenants and lessees; to keep in repair the communal roads and fences; to define and maintain the observance of the limits of public pastures; to let all the buildings in the towns which belonged to the public under the catalogue of shops, market-stalls, bakeries, mills, &c.: and to superintend the proper maintenance of the buildings so let; and even (under the special permission of the intendant, upon the showing of sufficient cause) to alienate entirely any real property belonging to the commune, such as superfluous pasture-grounds, &c. &c.

They had to form every year a register for the purposes of state, provincial and communal taxation, containing all the statistics necessary for the collection of the land tax, of the poll tax, the duty on the exercise of particular trades and professions, and the tax on all cattle used for agricultural purposes. Any appeal against the fairness of their assessment was to be made to the council within a fixed term after the publication of their yearly statement, and transmitted by them (if not summarily rejected) to the intendant. They were bound to put up yearly to public auction the office of collector, with all its privileges and responsibilities, a certain salary being in addition fixed by the intendant for the performance of this office. If no person of sufficient responsibility and competent property would accept the office, the council was obliged to divide the duties and the salary among themselves.

In the case of any communal debtor's defaulting, the collector applied to the intendant to send a soldier to take up his residence in the house of the debtor, and at his expense, until the payment of the debt, under certain limits proportional to the amount.

The communal administration had also the charge of the billetting and furnishing with forage, conveyance and maintenance, in whole or part, all troops passing through or resident in the commune, as well as of forming a statement of every particular expense so incurred, which after being countersigned by the commanding officer, was forwarded through the intendant to the provincial treasurer, to be considered as an instalment paid by the commune of its contribution to the state taxation.

Syndic.

The communal councillors received no payment. The syndic, whose duties were from the first of a more onerous character (as, in addition to convoking, presiding over, and being the official organ of the council, he had delegated to him the functions of head of the police, in the absence of a resident magistrate or police commissioner) received an arbitrary remuneration at the judgment of the intendant, in proportion to the actual labour of his office. In his character of police agent he could only arrest "en flagrant delit," and had in all cases to transmit to the judicial authorities a procés verbal of the circumstances of the case, with the depositions of witnessess, having no judicial power whatever in his own hands.

The council of every commune was ordered to propose a set of local laws and regulations (bandi politici e campestri) which, after they had been approved of by

by the intendant, and ratified by the supreme government, they were charged to enforce.

The system laid down in the statute of 1775, of which the outlines are here given, remained for many years with apparently little external alteration; and we may infer that through the vicissitudes of war and foreign dominion the institutions of Victor Amadeus maintained a more or less important, but real existence. They are assumed as the basis of the next statute on the subject, bearing the date of 1815, when the temporary restoration of tranquillity gave to the statesmen of the Continent, and Italy, an opportunity for internal improvement, of which they have not all been in over-haste to avail themselves. Edict of 1815.

The statute in question shows the effect of French influence. Its scope is declared to be the insurance of greater activity and centralization; and its main provisions are directed to define and increase the efficiency of the syndic as an executive officer, and at the same time his dependence on the government. He is to be henceforth nominated for larger towns by the King, for smaller by the intendant, from a list furnished by the council. Much which before passed through the council now passes through his hands only; he is placed in more immediate relation with the intendant, and subject to his entire control.

By a statute of 1817, the maintenance of roads and other public works confided to his care, is subjected to the surveillance of the "Corpo d'Ingegneri," another government body, and a very important one; and in 1818 the whole communal administration is definitively placed under the direct control of the Ministers of the Interior and Finance. Generally the object of these and other statutes up to 1838 may be said to be one; the more exact definition of the powers of the local bodies and officials, and the more complete subjection of them to constant central superintendence. It may be observed that by one of these statutes the sum to be raised by communal taxation for local purposes is limited to one-twelfth of the amount paid to the state by the commune in direct taxation; this, however, furnishes no measure of the real local expenditure, as no specific information respecting the amount of property usually possessed by the communes in their own right could be obtained. The classification of the communes was dependent upon the number of inhabitants (those containing more than 3,000 being in the first; from 3,000 to 1,000 in the second, and all below 1,000 in the third class), and therefore only secondarily on their wealth and importance; but the average revenues of the first class may perhaps be taken something less than 30,000 francs; and all possessing this revenue, as well as all the chief towns (cheflieux) of the provinces, submitted their budgets yearly to the King's own inspection. Edict of 1817. Classification of the communes.

A law of Charles Felix in 1822, gave order for the establishment and maintenance of one or more primary schools in every commune; but it appears that although most of the communes do still maintain these establishments, the elementary education of the people is in Sardinia, as in the Italian States, in general, very defective. All the establishments of public education, from the universities down to the royal, communal, and private schools, are under the surveillance of central bodies resident in Turin and Genoa (Magistrato di Riforma and Deputazione degli Studj), and this surveillance has in general been beneficially exercised, as far as the higher educational establishments are concerned. The proportion of the higher schools to the population is much greater in Sardinia than in any other Italian state; and the higher and middle classes are in general much more highly educated in these states; but the standard of education for the poorer classes is disproportionately low. Education.

The cities of Turin and Genoa have never (till the present year) been included in the general municipal constitution of the country. They have always had a separate constitution, and peculiar privileges; Turin being entirely, Genoa partially, independent of the Ministry of the Interior. Turin and Genoa.

The roads of the Sardinian kingdom are divided into three classes; royal, provincial, and communal. Of the last the whole expense is borne by the separate communes; for the second class each commune has to pay its quota in the provincial taxation; and all portions of the royal roads within the boundaries of any town of the commune through which they passed, are maintained at the expense of that commune; all classes being equally under the superintendence of the engineer in chief of the province. The system of "comandate" or requisition by the commune, of personal service in the construction of roads from the landowners, tenants, and all whose occupation implies much use of the public Roads.

roads in conveyance of merchandise, has been nominally kept up till the present time, with the option on the part of those so liable of commuting it for a money rate.

Edict of 1838.

The edict of 1838 does not contain much beyond a general re-arrangement of the earlier statutes, and a more precise definition of the respective duties of the communal officials in the administration of the public property. It does not discover any new principle or law of action, but the following words, introductory of its several provisions, are worth quoting.

"The attributes of the communal authorities are divided into two distinct classes, as follows:—

"1. The economical administration of each commune, entrusted to the inhabitants, under the direction and surveillance of the intendant.

"2. All that relates to military service and the police, under the direction of the commandant of the province, and the commissioner of conscription."

The edict proceeds to state that the *second* head, belonging more especially to the syndic, will not be treated of in the present instructions; the existing regulations, or those hereafter to be issued by competent authorities, being observed on this point. This classification points to two material facts which have been hinted at before; 1, that all the local government entrusted to the inhabitants is exercised under the surveillance of a high government official; 2, that the chief local executive authority is again connected with the State, as the agent of the military and police departments. In fine, these few lines of a Sardinian edict sufficiently define the Sardinian State as *military* and *centralised*.

Law of 1848.

The new law, published in January 1848, has, as might be anticipated, the apparent object of restoring some degree of independence to the local bodies. It introduces the principle of election, with a franchise varying, but generally high; the electors being divided into two classes, one of a per-centage of the wealthiest inhabitants of the commune, varying from 10 per cent. where the population does not exceed 500, to 1 per cent. for communes with 20,000 or more inhabitants, the other of all those whose position implies a certain intellectual capacity, *e. g.* members of the Royal Academies, graduates in honours at the universities, civil and military employés, &c., &c. The communal councils so elected are greatly enlarged; those of Turin and Genoa, which formerly consisted of eight members, have now 80; the other communes have 60, 40, and 20, according to their class. All the electors are eligible. To obviate, however, the tendency of these democratic vestries, which meet only twice a year for not more than 15 days, there is constituted a small permanent committee, called "Consiglio di Credenza," consisting of six, four, or two members, according to the class of the commune, elected by the council from among its own members once every year. These represent the council during the intervals of its meetings, as assessors and advisers of the syndic, and are jointly responsible with him to the council for all measures taken on their authority, with an appeal from the communal council to the intendant. The syndic henceforth is to be nominated directly by the King for all classes of communes alike, and the chain of political agents is carried down one link lower by the introduction of vice syndics, proposed by the syndic, and nominated by the intendant general from among the communal councillors, not merely presiding over the council during the absence of the syndic, but representing him permanently, and exercising a similar authority in the different hamlets of the commune in which they may reside; in other respects the actual administration of the communes is left much as before; all the additional duties connected with carrying out the detail of the new elective system being given to the syndic; but the provincial administration, which had hitherto been on a separate basis, except as far as the intendant was concerned, is now directly connected with the communes, and in the same manner the divisions with the provinces, by the re-organization of the divisional and provincial councils.

Elective principle introduced.

Enlargement of communal councils.

Consiglio di Credenza.

Provincial councils.

The provincial councils are composed of 30, 24, or 18 members, according as the population of the province is 150,000, 100,000, or less than 100,000. They are all nominated by the King, one-third among the syndics of the province, the remaining two-thirds from candidates proposed by the communal councils, each commune naming one candidate for every 1,000 inhabitants. All municipal electors are eligible after 30 years of age, except those in charge of the province, as the intendant, engineers, &c. The term of office is five years, one-fifth going out every year; they meet once a year for the dispatch of business, the intendant of the province, and the engineer being present without votes; they discuss all projects

projects connected with the public works, financial administration, and territorial distribution of the province, as well as all communal petitions for exemption of taxes or assistance in particular labours; they also elect from among themselves the representatives of the province in the divisional council, the number of whom is determined by the King. In addition to the presence of the provincial intendant, all their proceedings are transmitted to the intendant general, or head of the division, and submitted by him to the divisional councils, as far as concerns their sphere of duties.

Divisional councils.

These divisional councillors hold office for one year, but are re-eligible for any successive number of years; they meet once in the year, the intendant general, the provincial intendants, and the chief engineer of the division being present at their meetings, though without votes. They examine the financial statement of the intendant general previously to its being submitted to the King's approval; discuss all questions respecting roads, public works, provincial establishments or property, suits at law to be instituted, expenses for repair of diocesan edifices, charitable and collegiate institutions, and in general every subject "exceeding the purely executive power of the intendant general." All their proceedings are to be submitted to the Minister of the Interior, with whom the president of the council can correspond directly on subjects requiring special attention; the most important questions being also submitted to royal approbation. During the intervals of their annual session, they are represented by a committee of five (or consiglio di credenza) elected from their own body, and always re-eligible, who meet for the dispatch of any urgent or extraordinary business, under the surveillance of the intendant general, and, in fact, occupy a similar position with respect to him to that held by the communal "Consiglio di Credenza" in regard of the syndic.

Consiglio di Credenza divisionale.

Conservation del Censo.

This edict also establishes a set of government officers called "Conservation del Censo," charged with the compilation of all statistical returns for the purposes of taxation, conscription, sanitary reforms, &c., as well as with the general superintendence of the communal secretaries and keepers of archives. They are in direct communication with both the syndics and the intendant of the province* to which their district belongs, and are bound to report to him all facts respecting the condition of the province which are made known to them in the course of their duties. They are, in fact, a general commission of inquiry in permanent session.

Two members of each divisional council are to be selected by the King annually to represent it in the "Consiglio di Stato," in the place of two of the most distinguished inhabitants of the old military divisions who had been previously so selected. This provision has been rendered comparatively unimportant, and in fact annulled by the concession of a Parliamentary representative constitution; its appearance in the edict may lead us to judge how little the course of events was anticipated by its framers.

The general spirit of this elaborate organization cannot be mistaken; it is obvious that we have here the departmental councils of France, with a system of election less free than that by which they were created, at least before the late revolution, and that whatever be in other respects the value of the change, there is no trace of an intention to weaken vigorous action of the central executive. We shall meet with very similar institutions in the Neopolitan dominions, dating from the era of French occupation; institutions which however have proved powerless in that country alike to check the despotism of the supreme government and to secure an efficient, much less an honest system of local administration. In the Sardinian States the better spirit of the Government and steadier character of the people may lead us to hope for better results: no one denies that these States have in many respects been well governed for many years past; no one has the hardihood to assert that the Neapolitan States have not during the same time offered one of the worst examples of the worst of governments, an imbecile and dishonest absolutism. All know the spectacle presented by these countries; but he who enters Italy from the north-west enters a region in which the evidences of progress and prosperity strike even a careless traveller.

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* Many of these reports would, under the old system, have been sent to the commandant of the military division, but the new law places many of his functions, including all respecting the police, alike ordinary and political, in the hands of the intendant.

It is not unnatural to conjecture that had the new form of municipal Government followed, instead of preceding the political convulsions of Italy in this year, it would have been somewhat more democratic. Hardly two months had elapsed from the publication of the edict which recognised the provincial and communal administration, and introduced the principle of election into the kingdom of Sardinia, before Charles Albert found himself obliged to concede a political constitution of two chambers, one nominated for life, one representative. At the same time there is no direct connection, as the example of France may teach us, between local independence and what are commonly called free political institutions. It is right to mention that the new political constitution of the Sardinian States has no relation with the municipal system. The representative portion of it is based on population, in the proportion for the whole kingdom of one member to 23,000; the franchise is uniform and moderate, and the electoral districts each electing a member do not appear to have any relation to the provincial or communal divisions. What influence its working may exert on the system of local government must be a matter of some conjecture; but it is probable that if, as may be hoped, the Sardinian dominions continue to be well ordered and tranquil, the executive chain connecting the affairs of the smallest commune with the administration of the kingdom will lose none of its vigour by the introduction of the representative system.

The conclusion then at which I arrive respecting the office of these institutions in the Piedmontese States is, that they are means through which the Government acts upon the people, rather than means by which the people govern themselves. Still you cannot have institutions of this character so exclusively under control of the one principle as not to partake of the other. We shall see an example of the opposite theory in the original design of, and in the rights now popularly claimed by Tuscan writers for the Tuscan municipalities.

The memory of the great measure of Leopold I., the objects and character of his system, and the partial preservation of its forms and some of its spirit, combine to give importance to the subject in the eyes of the Tuscan writers, and to colour their views regarding municipal reforms of the present day. In the end of 1847 I found pamphlets on the subject, written apparently with much thought and care, and by writers of high reputation throughout Italy, very widely circulating in Florence. The principle of municipal life, as laid down by these writers, may be stated thus nearly in the words of one of them: the commune precedes the state, as the family does the commune; it is the fact unit of the political body, as the family of the social; and as an unit with a distinctly independent existence, it has a right, within its own sphere, to distinct and independent powers. "The municipal power is a sovereignty, proportionately limited; able to exercise, in relation to local objects, the identical functions which are exercised by the political power in reference to the State in general." (Leop. Galeotti, "sulla riforma municipale.")

It cannot surprise us that the maintainers of these views shall also wish to base political upon municipal powers; reversing directly the views upon which the framers of the Sardinian constitution have acted. In this they do but propose to carry out the views of the founder, Leopold, whose municipal constitution was intended to educate his people for political freedom, and furnish the ground-work of the political edifice.* The representative constitution, however, granted by the

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* *Note.*—On this point it may be advantageous to quote one or two sentences from Galeotti, showing the high theoretical views entertained with respect to these institutions by the more intelligent writers in Tuscany:—

"All know that the system of Leopold was intended, through the intermediate link of provincial assemblies, to be connected with a national assembly which, by its *right of petition* united with the *liberty of voting*, concerning the imposition of all taxes and burdens, would have attained as great political importance as the States General of Prussia have lately proved themselves to possess."

Again, after defining the commune, district, and province as the three links of intermediate associations which connect the individual with the state, and claiming the right of representation for every grade, he proceeds as follows:—

"On reaching this point (the representation by provincial councils) a most important political question divides all modern statesmen (in Italy, we suppose,), *i.e.*, the formation of the national representative assembly.

"The one side assumes the individual as the base of representation, and therefore, on reaching the point of provincial representation, stops there, and commences again with a separate representation independent of the municipal scale.

the Grand Duke of Tuscany in February 1848, is based, like that of Sardinia, not on the municipalities, but on electoral divisions determined by the population, 86 deputies representing the whole of Tuscany. It may possibly have been the tendency of the Tuscan writers at a time when the guarantee of political freedom, by direct representation, did not appear as nearly within their reach as it has since proved. The originally independent local institutions which had prevailed in the various cities of Tuscany during the existence of the Florentine Republic, though still nominally extant, at the accession of Leopold I. had been practically annulled by the Medici, through the constitution of a central body of provincial government, called "The Nine," resident at Florence, and invested with an absolute and final authority in all provincial affairs, which was immediately represented in the provinces by their resident agents, " The Cancellieri," who were only responsible to this central power for their local administration. " The Nine" had been afterwards replaced by a body called " The Chamber of Communities," but the system remained the same, until the publication of Leopold's edict in 1774, laying down the regulations, at first, for only one of the divisions of the Tuscan State, but afterwards extended in its main provisions to the whole. The avowed object of this edict was to release the communes from their excessively strict dependence on the Central Chamber of Communities; and the first and most necessary step towards this end is taken in the first sentence of the edict by abolishing all the local laws and privileges still nominally existing in the separate communes, so as to ensure a simple uniformity of system. The various functions of municipal authority were all re-arranged on one plan; the old machinery being in a great measure retained, not only in the nomenclature of the communal officers, but in the method of their election; the simple republican method of putting into a bag the names of all citizens qualified for the particular offices, and drawing by lot as many as were needed.

Edict of 1774.

The "Borsa."

The bodies composing the communal administration are the *magistrato* or magistracy and the general council. The magistrato consisted of the Gonfaloniere and Priori, whose number varied from five to 11, according to the class of the commune. They were drawn, by lot, from a list of all possessing a certain qualification of landed property within the commune; could not refuse office under pain of a heavy fine; were at first elected annually.

Magistracy.

All corporate bodies, secular or clerical, possessing the necessary amount of property within the commune, were to be enrolled for representation (either personally or by deputy) in the magistracy and council; and all women possessing so much property in their own right, were also enrolled for representation by proxy. The Gonfaloniere presided over the magistracy; he was elected by the same method of drawing lot, and subject to the same fine for refusal of office.

The general council was drawn in the same way from a list of all heads of families in the commune; the number varying in each commune, according to the various parishes of which the commune consisted, each of which, as a constituent unit, sent up one deputy to the council general; the Consiglieri were also elected annually, and were subjected on refusal to a similar fine.

General council.

The general council was convoked by the Gonfaloniere at least once a year, to assist the magistracy in auditing the last year's accounts, and making out the estimate of probable expenses and taxes to be imposed for the coming year; and on all other occasions where a proposition of extraordinary outlay or taxation was to be brought forward. The magistrato was convoked at the pleasure of the Gonfaloniere, whose presidence was necessary at all the meetings; two-thirds constituted a quorum, and a majority of two-thirds of those present was necessary to pass a resolution. At all the meetings of the magistracy and council the cancelliere comunitativo, or communal secretary (a government officer), was

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" The other side, assuming as their base the municipal body, after reaching the provincial council, make use of its elements for the formation of the national representative assembly."

This order of municipal representation has, however, never been carried out in Tuscany, even as far as the provincial councils. Galeotti refers to Sardinia and Naples as possessing the same in theory, if not in practice. It may be doubted whether he is not mistaken in supposing that, even according to the theory of the Neapolitan and Sardinian municipal constitutions, any moving power could reside at the lower end of the chain; and they certainly were never intended to give to the municipalities the importance which Leopold conceived, and which Galeotti would realise, of being the real base of political freedom and power.

was obliged to be present, with the duty of registering the proceedings and preventing any illegalities, and at all the meetings when extraordinary expenses were proposed, the presence of the Guisdicente, or local judge, was requisite, and his sanction of all measures then proposed was accessary.

Camarlingo. The camarlingo, or communal treasurer, was elected by the magistracy from a terna, or list of three persons drawn by lot from among those qualified to sit in the magistracy as priori; they could not be re-elected after service of three years, but were subject to the same fine for refusal of office as in the case of the magistracy of the general council.

Cancelliere. The office of cancelliere constituted in this scheme the main link between the Government and the municipality, and Leopold showed his estimate of its importance by a code of institutes issued to those holding it, in which they were entreated to use their best efforts for the welfare and protection of the communities under their charge, especially of the poorer classes therein, and warned that their conduct would be watched, and rewarded according to their merits.

All the various taxes in the separate communes were repealed, and replaced by a single one to the same extent for each community, called "The Tax of Redemption." This tax, since commuted for a land tax (of which the amount paid directly to the State is fixed, the sum raised by it for communal expenditure varying according to need, and being levied in the form of centimes additionali on the fixed amount), and all the local expenses were to be met, in the first instance, by the rents of the commune, and (if they were insufficient) by a fixed poll-tax on all proprietors, peasantry and artisans; and a variable tax on the holders of real property in the commune, the general council having the right to fix the limit of property down to which this tax should be imposed for the current year.

For the equal distribution of the local taxation, two deputies were elected by the magistrato from four names drawn out of the list of those competent for the office of priors, who were charged with assessing the various contributors, subject to the revision of two officers called revisori, elected in the same way from the list of all possessing any real property whatsoever; upon their assessment the magistracy and council authorised, through the Gonfaloniere, the treasurers to exact the necessary contributions. An express order was made that no church property should be exempted from the payment of its due proportion.

Roads. The magistracy elected from among the inhabitants of the commune a superintendent of roads (prooveditore di strade) instead of the old Government officer. His term of office lasted for three years; and his duty was to visit all the roads and public works, to represent to the magistracy all necessary or advantageous undertakings, and, on their approbation, to superintend the proper execution of any such works. He was responsible to the magistracy for the performance of his duties, and only received his salary after their approbation was expressed at the termination of his office.

All roads were to be maintained at the charge of the commune, except the strade regie, or royal post; roads from Florence to the borders of Tuscany; and all portion of these within the limits of the various towns through which they passed, were to be maintained at the expense of the commune to which such towns belonged.

The communes of Tuscany had not previously the power of alienating any of their property, however vested, without the approbation of Government; but this law contained an express order to all communities either to sell or let on perpetual lease all the communal lands; great tracts which had hitherto lain waste, or nearly so, were by this means brought extensively into cultivation, and made the source of wealth alike to the cultivators and to the communes, in whose hands they had hitherto remained an unprofitable property.

All tenders were to be received by the magistracy publicly, or the property was to be put up to public auction, an average having been previously taken of the actual produce, or an estimate of the probable receipts from the land when cultivated. They were to be let at an annual rent, with a fine on taking possession, not less than one year's rent, the property to continue for ever in the male line of the tenant, diverting to the direct female descendants of the last tenant for life only, in case of there being no male heir; they could be sold, willed away, or divided among several inheritors. All alienation, by sale or otherwise, in favour of persons not comprised in the line of direct descent, must be previously notified to the magistracy, on pain of being null or void; a new lease was made out

out on similar terms, except that the fine now paid on taking possession was to be diminished to one-fourth of the original one. If by the failure of the direct line or otherwise, the estate returned to the municipality, the first refusal of the lease was to be offered to the nearest relations of the late tenants. The tenants were bound not to impoverish the soil, and all the improvements made by them returned with the land to the municipality in case of reversion. The being two years' rent in arrear, or contracting debts on the estate to that amount, or visibly impoverishing and neglecting the land, subjected the tenant to immediate forfeiture of his lease, in which case his goods might be immediately seized for the payment of the debt to the commune, which was considered the first debt on the property.

All the money arising from the sale or lease of the aforesaid lands was to be immediately invested for the benefit of the commune in the Monte di Pieta at Florence.

Florence.

The municipal regulations for Florence and the other cities were on the same principle as those for the communes in general, with the difference of qualification for the various offices. In the country the list of those eligible for the general council contained (as aforesaid) all the heads of families; in the cities only the possessors of real property to a certain amount. The magistracy were drawn not from one list, as in the country, of all with a certain qualification of real property, but from three distinct lists; 1, of all nobles who were heads of families; 2, of the heads of the chief families of burghers; and, 3, of all representing families possessing a certain amount of real property (twice the amount of that necessary in the country communities). From each of these lists one-third of the magistracy was to be drawn, the first of the nobles drawn being made gonfaloniere.

By a later edict Leopold conceded to all resident foreigners and non-Catholics the exercise of municipal rights. The local constitution given by these measures to Tuscany is thus illustrated by Napier:—

"The chancellor of sesto and fiesole comprised under him the communities of fiesole, sesto, and campi; the first contained 37 parishes, the second 24, and the third 35; each community was represented by a gonfaloniere and deputies, or priors, and the general councils or assemblies by 20, 24, and 20 deputies respectively; so that 96 small parishes were locally represented and governed by 97 men, elected from almost every class, down nearly to the most indigent of the people, and all this by an absolute monarch."

In estimating the real power exercised by these representatives we must not forget the presence of the "Cancelliere," and we cannot doubt that the influence of a clever and educated man representing the supreme government, and possessing no small share of direct authority as legal adviser, treasurer, controller of finances, &c., would, over such assemblies as the general councils above described, be nearly absolute. There were however the forms of freedom, the right and the recognised channel of making known a grievance or resisting an oppression; and in the more powerful city communes the independence would be more real. An observer however of the system at the point at which it was left by Leopold, would have said that the final result at which it was to arrive depended on the spirit in which it was worked out, on the alternative of the growth of the communes into independent power, or the absorption of all local independence in the central government, through the medium of the cancelliere. This last has been the practical result.

The principle of extraction from the "borsa," or list of persons qualified for office, is (as mentioned above) purely democratic. Proceeding on the assumption that all citizens are competent to exercise certain powers and to perform certain duties, it confides for convenience the actual execution to a few, and by taking those few by chance it excludes favour and interest, and asserts absolute equality. It is singular to find such a system jealously enacted as a safeguard of freedom in the states of ancient Greece, and similarly adopted in the equally suspicious Italian cities, granted freely to his people by a despotic prince in the 18th century. Its actual working however is stated, with apparent reason by the Tuscan writers, to have run counter to its expressed object, by admitting the less capable equally with the more, to a place in the communal assemblies, a fact which has deprived those assemblies of weight, under pretence of preserving their independence. Bodies not selected for real or supposed fitness carried with them no authority, and fell naturally and easily under the absolute control of the central administration. While the priori, in consequence of their higher social station, have retained a share of power (though in a very subordi-

nate degree), the general councils have become mere nonentities, and their abolition, at least in their present form, is thought generally to be desirable.

The Tuscan communes are less numerous in proportion to the population, and therefore, on an average, larger than the Sardinian, most of them containing many parishes.

The whole Grand Duchy is divided into five compartments, 89 cancellerie, and 248 communes. The political is not, as in Sardinia, united with the communal administration. The state is divided into governments and commissariates, which are again subdivided into vicariates and "potesterie;" and the gonfaloniere, who is in direct "rapport" with the governor, commissary, vicar or podesta, the officer of "buon governo," *i. e.*, the political head of the district, is the only point of contact of the two systems.

The general forms of the system sketched above continue with comparatively little variation, but the independence which (in the words of Ricci) "was fully proclaimed by the law of Leopold both in letter and spirit as the ruling idea of the Italian municipalities, though never expressly taken away by subsequent dispositions, has been indirectly violated by them in a thousand ways."

The main alterations (so far as the mere constitution of the municipal bodies is concerned) since the law of Leopold are as follows: doubling the legal qualification for the magistrato (rated by Ricci as now equivalent to 14,000 francs of capital) and giving to the Government by its officers the respective "Prooveditori delle camere communitative" in the five compartments their nomination out of a list of double the necessary number of names drawn out of the borsa or list of those qualified, besides abolishing entirely the drawing by lot for the office of gonfaloniere, who is now nominated directly by the Government from the list of those qualified, out of whom he would formerly have been drawn.* The general tendencies, however, of a great variety of minor alterations, and of the political and social constitution of the country, modified as it was by the centralizing spirit introduced during the French dominion, have made of the free municipalities of Leopold a recollection rather than a reality. The whole administration of the communes is rigorously watched and guided by a central body in each compartment, of the rise and progress of which Ricci, the writer above quoted, gives a short sketch to this effect: "The principal idea of the chamber of communities or soprasindacato (instituted in 1769) was to create an office combining executive and judicial power, which should assume the functions previously exercised in a disorderly manner by different courts, and give a certain unity to the municipal system, without curtailing its power too closely." It was, in fact, Leopold's first attempt at municipal reform, and was practically reduced to minor importance by his subsequent liberal edicts; but "in 1814 there were instituted (or rather revived under a new name) chambers of communal superintendence in the four compartments of Florence, Pisa, Siena, and Grosseto, under the directions of the so-called prooveditori. To these was afterwards added the chamber of superintendence for Arezro, by a law of 1825, which is in fact the corner stone of the present system, inasmuch as it constituted and regulated the corpo degl' ingegneri; and the office of soprasindaco was revived in 1840 under the name of sopraintendente generale."

"The relations between the chambers of superintendence and the corps of engineers are excessively close and numerous, insomuch that under many aspects their functions coincide, the point of contact being in the inspectorship of the compartment."

"The objects of this institution were threefold. It was intended, in the first instance, to guard the interests of the inhabitants from the officers of the commune; secondly, to protect the interests of the state in the commune; and lastly, it was an attempt to reconcile the vitality of the whole state machine with that of its separate members."

"For these purposes two principal means were adopted: first, the placing the cancelliere in immediate dependence on the prooveditore, thus giving the superior officer a legal and regular method of knowing every proceeding of the local representative body, and influencing, or even guiding them absolutely; secondly, the declaring

* *Note.*—The gonfaloniere of Florence has always been a person of high rank and distinction, though the office conveys no political power. In the last news from Italy I see that the gonfaloniere of Florence has just relinquished the attempt to form a ministry (August 1848).

declaring the approbation of the prooveditore necessary previous to putting into execution any resolutions of the communal assembly."

It will be seen from this sketch that the duties of the prooveditore correspond very exactly (as far as the communal administration is concerned) with those of the intendente in Sardinia and Naples, as do those of the cancelliere with the segretario, and the gonfaloniere with the sindaco; and the result is described by all the Tuscan writers as exactly similar. Galeotti asserts that "there is a simultaneous pressure of the police, the ministry of finance, the chamber of superintendence, and the corps of engineers, upon every commune; which, moreover in its local judge, chancellor, and engineer, possesses three eternal overseers, rendering the smallest freedom of action impossible"; and Guido Rontani refers emphatically to the preamble of the law of 1774 as still to be realised; the emancipation "*from that strict dependence* at present in use on the higher offices, by the means of which the central power overlooks, governs and chains down their liberties."

The immediate occasion of all the above pamphlets was the nomination of a legislative commission for the reform of the Tuscan municipal system in 1847. No change in the system has as yet been made; but in the manifesto issued on the granting of a political constitution to Tuscany, a promise was made that this subject should be among the earliest brought before the new Parliament. The chief alterations suggested by these writers are, the abolition of the general councils; an increase in the number of the magistrates, and a raising of the legal qualification for office, admitting at the same time all men of letters or science without a property qualification; the substitution of popular election for the old method of drawing lots, and the confiding to the magistracy the choice of the terna from which the Government is to select the gonfaloniere. Either the gonfaloniere of the province, or deputies elected by the magistracy, are to form a compartmental council, to be presided over by the prooveditore of each camera di soprintendenza; and either the whole of, or deputies selected from, these compartmental councils, to form a central municipal council, headed by the superintendent general, to be convoked either at the will of Government or on the request of the provinces. They also propose a definite division of the body of engineers into two branches; one to be exclusively occupied with the state and provincial works, and directly corresponding with the prooveditore and compartmental council; the other exclusively occupied with municipal works, perfectly independent of the state branch, and free to act (up to a certain limit of expense) immediately on the orders of the gonfaloniere and magistrato.

Such then is the outline of the present municipal system of Tuscany; setting out from opposite principles to that of Sardinia, and arriving hitherto in practice at a very similar conclusion, a fact which, however it may influence our views of the advantages derivable from the centralizing principle, cannot but illustrate the strength of the tendency which has during the last half century carried almost every civilized nation in that direction, with the exception of England and America, a tendency which, opposed as it is in one sense to freedom, has yet little to do one way or other with the distribution of political power, to which we give *par excellence* the name of constitution; a tendency which the government of one, though it may forward, does not create, and the government of many does not destroy.

The Papal States have also a municipal system of their own, different from those hitherto described in names, and also in some essential points, but resembling them in showing traces of the French occupation, and in this main point, that to give any idea of the communal organization we must give some account of the state. It is however more difficult to arrive at or convey a correct impression of the working of these institutions in the Roman States, as the central government, however arbitrary, is weak, and its action irregular, and thus it may happen that the local authorities are in practice occasionally more independent than in Tuscany or Piedmont; undoubtedly not with the result of better administration.

The existing system, as far as it can accurately be deduced (not without difficulty), from the edicts of various Popes, from the great statistical work of Serristori,* from the interesting and able volumes of M. Toumon, Prefect of Rome

* "Statistica d'Italia."

Rome during its occupation by the French,* and from private information, is as follows:—

The Papal States are divided into 20 provinces; of these all but the "Comarca di Roma" are formed into delegations, called legations, only when a cardinal is appointed to the post. Of these there are five. In several cases two of the smaller provinces are united in one delegation (such are called "reunite delegazioni") so that these were at one time only 13 separate Governments,† exclusive of Rome and the Comarca; but the number has varied at different periods. Each is divided into (or constitutes singly, but is in most cases divided into several) districts of government ("distretti governativi"), and each of these into communes. For each legation or delegation the cardinal legate or the prelate delegate for each district a governor of the first or second class, and for the commune the gonfaloniere are respectively the functionaries constituting the administrative authority. It must be observed that the governors are also, both in civil and criminal cases, possessed of extensive judicial powers, besides being charged with the administration of the police of their respective Governments, and the employment of the public force. They can judge, without appeal, in all cases up to the value of 200 dollars, and in criminal cases (with appeal) to the extent of a year's hard labour. Each commune consists of a town or large village with an arrondissement, including therefore several parishes. The whole number of communes in the Roman States is 834. The population varies greatly, from 1,000 to 14,000. In every commune there is a deliberative council and an administrative magistracy. The council vary in the number of members, from 48 for the communes with a population above 10,000, to 36 for those above 4,000, 24 for those above 1,000, and 16 for the rest; a modification of these numbers being in the power of the provincial authorities on sufficient reasons, such as the residence of a governor in one of the smaller communes, &c.

Communal Council.

The consiglieri are divided equally into three classes: 1, nobles; 2, landowners or possidenti (when no nobles hold property in the commune, the possidenti are divided into two classes, according to their property); 3, other eligible citizens, such as literary men, merchants, or any persons engaged in respectable business. For those possessing property in the commune residence is not a requisite; and an absentee proprietor may appoint a proxy, to be approved of by the delegate. Certain near relations cannot be members at the same time. By the first constitution of this council the membership was made hereditary (the original members being nominated by the Government), and the election of a new councillor only devolved on the council in cases of entire extinction of a family; but by a later law one-third of the council goes out every two years, and the election of the new members is in the hands of the remainder, those who have gone out being always re-eligible. The existence, up to the year 1831, in an European State of a hereditary caste of vestrymen, is not less curious than the existence of the democratic borsa, in absolute Tuscany. The magistratura consists of a gonfaloniere and anziani (aldermen), elected by the communal council, subject to the approbation of the delegate; the number of the magistracy being nine for the first class of communes (when there are 48 councillors), seven for the second, five for the third, and three for the lowest. The gonfaloniere, who is to be always chosen from one of the most respectable families, resigns office at the expiration of two years; and a part of the magistracy also goes out every two years, so as to renew it entirely once in six years; but all members resigning are immediately re-eligible. Two-thirds at least of the magistracy must belong to the class of landowners; 30 years of age is a necessary qualification; and the same are required in other respects as for members of the council. The Government communicates with the magistracy only. The consiglio names, once a-year, the subordinate officers of the commune, and can in most cases remove them without appeal. Once in every year the magistratura forms, and submits for the deliberation of the council, the communal budget for the ensuing year (tabella di prevenzione); they approve or alter it, and transmit it, with their reasons, within a certain term (about 14 days) for the decision of the legate or delegate and his council of government (Congregazione Governativa), whose sanction is final. This council of government consists

Magistracy.

Congregazione Governativa.

* "Études Statistiques." † "Motu Proprio" of Leo. XII., 1824.

consists of four members, nominated by the sovereign among the most distinguished inhabitants of the province, and always accompanies the delegate; on all economical points it has the power of voting, on others it simply advises the delegate.

All alienation of public property must be sanctioned by a central body, the Congregazione di Buon Governo* (consisting of 12 or 14 cardinals and prelates), for all the provinces subject to its inspection.

The magistratura presents once a year to the consiglio, to be transmitted by them after examination to the delegate, the accounts of their administration for the previous year, in which they must especially account for any extraordinary expenses not provided for in the "tabella di prevenzione," which they are only allowed to incur in extreme cases of necessity. In ordinary circumstances the council meets three times a year: in February, to receive and audit the accounts of the previous year; in September, to deliberate on the budget of the coming year; and at the end of each year for the election of communal officers, but it may be called together oftener, if necessary; the presence of two-thirds of the consiglieri, of the gonfaloniere, half the anzioni, and the governor of the district, is requisite to form a legal meeting.

Some, but few, of the communes have still property belonging to them; the ordinary expenses of the rest are provided for by taxes on provisions brought to market (dazj di consumo), fees exacted for the public weigher, for licenses to shoot, ferries, &c.; and extraordinary deficiencies are made good by taxes on persons, on cattle, and an additional imposition of the land tax. What the proportion of the local expenditure to the general expenditure of the state is, I have no means of ascertaining.

In every delegation there is a provincial council, meeting ordinarily once a year, for not more than 15 days, but it may be convoked extraordinarily at the pleasure of the sovereign. It is presided over by the delegate, or a deputy appointed by him, and is constituted in the following manner: Every district in the delegation has one member for every 20,000 inhabitants. All the communal councils of the district send up four, three, two, or one (according to the class of the commune) deputies to the chief town of the district; the assembly of these deputies, under the presidency of the local governor, select by majority of votes as many "terne," or lists of three names, as there are vacancies for the district in the provincial council. The "terne," so selected, are transmitted by the governor to the delegate, and through him to the sovereign, who selects one from each terna. One-third of the provincial council goes out every two years, and the power of dissolution of the whole at any time is in the hands of the sovereign. The office is gratuitous, and a more stringent scale of excluding relationship is in practice than in the lower councils. They examine at their ordinary meetings the provincial accounts for the past year, and the budget for the ensuing one, of which they distribute the collection among the separate communes; they also confer with the engineers of the province on the public works to be undertaken or projected in the coming year. They nominate an administrative commission of three members from among themselves, to represent the council during the intervals of its sessions. All the acts of the council are submitted to the delegate and his "Congregazione Governativa," and transmitted through them to the central government for its sanction.

In practice, the consiglio provinciale generally consists of the gonfaloniere resident within the province, who very seldom oppose any measure submitted to them by the delegate. The powers of the gonfaloniere are very strictly limited to his administrative functions. He has no authority in matters of criminal police, not even to direct an arrest. He can simply report to the governor of the district, or to the "brigadiere" commanding the force of carbineers stationed in the commune, who can act thereupon (or even without any notice from the gonfaloniere) as he thinks fit, as he is (in the absence of the governor) the responsible officer for the preservation of good order in the commune. The maintenance of the police, and all troops stationed in the provinces, is paid by the provinces themselves.

It

* This body, in fact, performs many of the functions of a Camera delle Communita: first, by its secretary, and, in the last resort, by itself. Besides regulating the revenue and controlling the expenditure, it is, or ought to be, the ultimate tribunal for the protection of the interests of the communes.

It appears that the delegates are in practice very absolute, and quite independent, except in extreme cases, of the central Government.

Such is an outline of the system in the Papal provinces, so far as any fixed system can be said to exist therein.

Mr. Petre informs me that the great complication of the Papal system of government and the confusion of ecclesiastical and civil authority interfere very considerably with the literal working of this system; at the same time there is a real share taken by the communal bodies in the management of their own affairs. The higher orders, according to his statements, complain much of the extent of communal taxation to which they are subjected through the medium of these practically almost permanent councils, influenced and backed by the Government, and by them the demand for reform is most forcibly urged.

It is remarked by Tournon that the expenses borne by the communes in the Papal States include many which in France form a share of the expenses of the general government. He enumerates among the communal expenses (in 1809) the following:—Salaries of the magistratura and officers of the commune; payment of the governor or civil and criminal judge, "bargello" (sheriff) greffier, and advocate of the poor, maintenance of prisoners, salaries of a physician and surgeon who attend the inhabitants gratuitously, secretary, schoolmasters and schoolmistresses, preachers in Lent and Advent, public edifices, roads, &c., and finally a payment to Government for keeping up the high roads. M. Tournon claims for the French the credit of having systematized and improved the communal administration of the Papal States, and in particular of having drawn for the first time a distinct line between the expenses of the state and of the communes, and states that the edict of 1816 adopted the greater portion of the French improvements. It will have been observed that the system above sketched does not include Rome and its arrondissement, the Comarca, which up to the time of Pius IX. was an exception to the general municipal and political system. Rome was presided over by a governor, possessed of most extensive powers, both executive and judicial, reaching in the latter capacity, if I am rightly informed, even to cases of life and death.

Rome and the Comarca.

Some, but a very limited, portion of municipal authority involving attributes such as presidence at public games, &c., was in the hands of the Senator of Rome, an office rather of dignity than power, and three conservatorii, who also (consistently with the practice universal in these States of uniting in the same hands executive and judicial powers) presided in the minor civil and police courts. "This union" (says Tournon) "of the power of administration and the right of judging, shocks minds habituated to see an inflexible line drawn between those two attributes."

A most important alteration however was introduced by the celebrated edict of Pius IX., dated October 1847, constituting a municipal government for Rome and the surrounding territory; a measure of reform which appeared at the time not less important than that by which Pius constituted (nearly at the same time) the "Consulta di Stato," or first Roman Parliament, which was also (though subsequent changes have thrown it into the shade with startling rapidity) considered as a great and most interesting concession.

Motu proprio of Pius IX.

The municipal constitution for Rome and Agro Romano, as organised by the aforesaid law, is as follows:—

Municipality of Rome.

There is a deliberative council and an executive magistracy. The council is to be composed of 100 members, residents in the territory, above 25 years of age, and of unimpeached character. Sixty-four of these are to be "possidenti," or proprietors, of whom at least 15 must have an income of 6,000 dollars, 34 of 1,000 dollars, and the remaining 15 of 200 dollars a year, derived from land, or twice the amount from other sources. For the lowest qualification, the property must lie within the boundaries of the Agro Romano; for the higher, it need only be in the States of the Church, otherwise the great nobles, all possessing estates in the country, would have been excluded from the council of Rome. Of the remaining 36 members, 32 are to be chosen from among men of science, merchants, traders eligible to the Chamber of Commerce, &c., and four are to be the representatives of ecclesiastical, charitable, and other public establishments; two to be named by the cardinal vicar, and two by the Government. All the others are to be nominated for the first time by the Pope, afterwards to be self-elected, one-third going out every two years, so that the whole council is renewed in six years; members may be re-elected immediately once, but there must be an interval of two years before the third election of the same person.

All

All relations within the third degree of actual councillors, all persons in the debt of, or at law with, the City of Rome, or with accounts for any contract with the city still open, are excluded; as well as all persons lying under an interdict. The President is deputed by Government.

The magistracy, or senate of Rome, consists of one senator and eight conservatori. They are all elected by the council from its own body, three from the highest class of proprietors, three from the second class, and three from among the other consiglieri. The senator and president is nominated by the Pope from the three conservatori of the highest class, and retains office for two years, the whole magistracy being renewed, as the council, in six years.

By this institution the arbitrary and discretionary power of the Secretary of State and the Governor of Rome are greatly lessened, and the entire municipal authority of the city placed in the hands by laymen, an innovation which, however familiar it may have become since, was yet startling less than a year ago.

The expenditure in Rome for municipal purposes is naturally very large, as may be judged, partly from the fact that the Pope has assigned to the expenses of the new municipal body an annual sum of 500,000 dollars, until the exact revenues applicable to those purposes shall have been clearly defined, as well as from the return given in Serristori's work, where the average expenditure "for public works and Rome" (two heads apparently always classed together in the State returns) is set down at 580,000 dollars.

M. Tournon gives the municipal revenues of Rome, under the French Administration (1812), as 2,800,000 francs, equal to nearly 560,000 dollars, employed in the maintenance of churches, hospitals, relief of poor, establishments for instruction, lighting and embellishing the city, &c. The whole public revenue of the "Province de Romi" was at this time not more than 10,000,000 francs, or less than four times the amount of the city revenues. The administration of pious foundations naturally forms no small part of the municipal expenditure of the Holy City. Serristori has a singular remark on this head on benevolent establishments: "Exact figures reveal a singular fact; that in proportion to the population, the amount assigned for purposes of beneficence and charity is greater in Rome than in Paris. '*Dorebbe dunque credersi che in Roma non esistesse mendicita!*'—an inference too unhappily at variance with fact to be permitted."

With reference to the actual education of the population of the Roman States, there are no sources of information that can be relied on; though it is asserted that in Rome education at elementary schools is provided for 15,000 of both sexes. There are certainly many such institutions, both in Rome and in the country; so that (says Tournon) "there is not a single child who may not receive the benefit of primary instruction. But," he goes on to add, "it is here, as in most other places, the poor children, distracted from their study by field labour, without leisure at home, and without means to practise themselves in reading and writing, soon forget what they have imperfectly learnt." In fact, the education of the lower classes in the Papal States is considered to be behind that in most parts of Italy. The municipal authorities are charged with the surveillance of primary education, but neither they nor anyone else performs the charge. Indeed, under the Government of these States, as hitherto administered, good regulations have been entirely neglected in many other matters besides the national education.

M. Tournon, speaking of the system established in 1816, says, "This mode of municipal administration, evidently borrowed from the French system, will astonish those who believe that in the Papal States everything is done arbitrarily, and by sovereign pleasure. Without doubt *abuses of power are very frequent*, but *the written law is more favourable to liberty than is generally believed.*"

The last as well as the first part of this sentence is true, but the written law is found to be of a very flexible material in States where the offices of governor and judge, of the declarer and the administrator of the law, are nearly always united. The confusion in judicial proceedings is almost infinite and irremediable; there is hardly a cause in which the Government can be in any way concerned, which they cannot at pleasure remove out of the temporal into some ecclesiastical court, and this power has been freely exercised whenever they have found a cause going against them. Moreover, the written law itself is, on any subject of any degree of complexity, such as this of municipal government,

very difficult to discover. An edict is published with all formalities, establishing certain rules for the whole State, and a number of circular orders ("ordini circolari") may follow, sent round to the different Governments, altering or modifying it to whatever degree may be deemed advisable. This great but irregular exercise of absolute power is, however, much neutralised by the absence of any constant control over the delegates, and, in point of fact, the Government of these States is more provincial, so to speak, than those hitherto described. The comparative freedom from perpetual interference on the part of the Central Government creates a greater opening for local influence, and although the provincial councils are limited in both their objects and their authority, the importance which might be attached to them was acknowledged by the present Pope, when he made them the basis of his Consulta di Stato, the first form of a representative assembly for the Holy See, although, as in other cases, this has been supplanted almost before coming into existence, by the creation of a Parliament based upon direct representation.

The account of the Neapolitan system of provincial government contained in the Appendix is mainly derived from the oral communications of a gentleman thoroughly acquainted with the details of the Neapolitan written law on these points, and equally competent to judge of its practical working. Thinking it probable that there cannot be found in England, at least, any equally full and accurate account of the institutions of this interesting country, I have not attempted to abridge it, but have left it exactly as I received it from my informant. It is, in fact, a complete account of the civil constitution of the kingdom, as it existed (on paper) previously to the events of this year, which made even Naples in name, and for the time, a constitutional monarchy, and as, with the exception of the addition of two chambers, debates, and a press nominally free, all lingering in a precarious existence between the fear of the inconsiderate violence of the mob, and the perfidious violence of the monarch, it exists now.

Of all the systems which have been sketched, the Neapolitan is the one most exactly corresponding with the French model; it is the same, not exactly word for word, but institution for institution. It can hardly be called an adaptation, it is not a grafting upon a foreign stock, but a transplantation of the complete and full-grown tree. To describe the leading forms of the one is to describe those of the others, and instead of repeating the details of the copy given in the Appendix, it will be sufficient to borrow from Thiers a description of the leading idea of the original, and the manner in which it was worked out by the legislative genius of Napoleon. The identity of the means employed is as marked as the contrariety of the results. Any one disposed to think that similar institutions must work similarly need only compare the provincial administration of France and of Naples to be at once disabused of an error sufficiently prevalent now, though less so than formerly. In order to make more distinct the identity of the two systems, I have placed the Italian names for the corresponding offices opposite the French names in the text of M. Thiers.

The creation of the existing provincial administration of France, in the year 1800, out of the chaos of materials left by the Revolution, is described by Thiers as follows, "Consulat," Vol. I.:—

(He has previously described the existing confusion, especially the disorder caused by the abolition, so to speak, of the communes, and creation of "central municipalities," embracing several communes, without any direct surveillance on the part of the central Government.) "For such a situation the First Consul was, one may say, the direct emissary of Providence. His simplicity and justice of mind, joined to a character of resolution and activity, naturally conducted him to the true solution of these difficulties. The constitution had placed at the head of the State an executive as well as a legislative power, the executive concentrated almost entirely in a single head, the legislative divided into several deliberative assemblies. It was natural thus to place at each step of the scale of administrative government a representative of the executive power specially charged with *action*, and at his side (simply to control or enlighten him, but not to act in his place) a small deliberative assembly, such as a council for the department,

department, arrondissement, or commune. To this simple, clear, and fertile idea is due the beautiful system of administration which France now possesses. The First Consul placed in each department a prefect, with the duty, not of urging on an administrative body the performance of the business of the State, but of performing it himself, and charged at the same time with the management of the affairs of the department, but (in this instance) in conformity with the wishes of, and from the funds voted by, the departmental council.

The corresponding offices in Naples are the Intendente, Consiglio Provinciale,

"In the first place, the communal administration was restored to its right place, the commune itself, whether town or village; and between the commune and the department an intermediate step in the administration was introduced, *i. e.*, the arrondissement. Between the prefect and the maire came the sous-préfet, charged with the direction (under the surveillance of the préfet) of a certain number of communes, 60, 80, or 100, more or less, according to the importance of the department. In the lowest grade of all, the commune itself, was the maire, also an executive authority, with the municipal council at his side as a deliberative authority, an agent in direct dependence on the State for the performance of State business, and at the same time an agent of the commune for local business, conducting its affairs in conformity with its own wishes, under the surveillance, of course, of the prefét and sous-prefét, and consequently of the State.

Sott Intendente,

Sindaco,

Decurionato,

"Such is this admirable hierarchy to which France owes an administration incomparable for the energy and precision of its action and the purity of its accounts, so excellent, that in six months it re-established order in France." Here follows an account of the permanent council of prefecture, uniting judicial and administrative powers, and then comes the following *resumé*:—

Consiglio d'Intendenza,

"Such was the provincial and communal government of France; a single head, prefect, sous-prefect, or maire, for the execution of all business, a deliberative council for the department, the arrondissement or the commune, voting all local expenditure, besides a small judiciary body placed at the side of the prefect (alone) for the administration of justice, a Government absolutely subordinate to the Central Government for State affairs, watched over and controlled, but with a certain independence of opinion and action in the affairs of the department and the commune. Order and justice have reigned without interruption ever since the adoption among us of this beautiful and simple system, that is to say, for nearly half a century; the expressions "order" and "justice" having, of course (as all words in all human languages), only a relative value, and meaning that in France, with regard to the administration, there has been as little disorder and as little injustice as can possibly be hoped for in a large State."

Consiglio Distrettuale.

The exact correspondence of the systems may be seen by the comparison of the text with the margin. The forms are absolutely identical. It is certain that their operation in France has to a great extent justified the high but not inconsiderate commendation of M. Thiers; it is equally certain that no possible extension of the relative value of words, no allowance for the necessary imperfection of human order and justice, will permit us to apply in any sense to the provincial administration of the Neapolitan dominions the cautious and moderate eulogium of the statesman and historian. Identical forms have produced opposite results. In translating the one system into the other, energy and precision of action may be translated into weakness and laxity, purity of accounts into corruption, comparative justice and order into the most positive injustice, oppression, and irregularity, as exactly and truly as departmental into provincial, and préfet into intendente. The reasons may be various, but the fact is unmistakeable. The checks and balances of power which in France are so effective in securing an honest and judicious application of public property, are in Naples only so many additional bars in the way of any action at all, so many more securities for the misapplication of the local and provincial funds. Those who are supposed to protect the interests of the public against each other combine their forces to the injury of those interests, the engineer is in league with the contractor, both of these, with the sott intendente and intendent, and the intendent with the minister; and the conspiracy against the public does not stop even there. The accounts given in the Appendix of the formation and functions of the provincial councils might justify the belief that these bodies were possessed of some real efficiency and importance. Constituted from among the higher classes of the

province, entitled to approve or censure the conduct of its highest officers, with the provincial budget of the year dependent on their sanction, and the right of deputing to the Central Government persons charged with the urging their views upon it, they might have been expected to possess some real weight and authority; to be able, at any rate, to limit abuse, if they could not ensure useful activity. But their practical function is so well known to be limited to registering the proposals of the intendente, that it has passed into a proverbial epigram, expressed in the question and answer: "Che fa il Consiglio?" "Approva." The manner in which the deputies sometimes sent by them to the capital are treated, is referred to in the Appendix.

The only real independence occasionally shown is on the part of the Decurionato, or Communal Council: some vestryman, trusting that his obscurity may protect his obstinacy, occasionally opposes himself to the will of those who represent the Government; but this is naturally rare, and the power possessed and occasionally exercised by the authorities to arrest such a person without assigned cause, and imprison him during their pleasure, renders the increase of such occurrences highly improbable.

The greatest sufferers by the combination of tyranny and mismanagement are those communal officers who are unfortunate enough to come under the head of "contabili," *i.e.*, persons who have public funds to dispose of and account for; others may escape by non-resistance: the only resource of the trustee, holding an office which he cannot decline, and forced to make payments which he cannot authenticate, is forgery. His position is said to be made more difficult by the extreme particularity exacted in the accounts, a particularity which in a system so loose and corrupt in its moving forces, simply increases the probability of fraud. Accordingly the corrupt "cassiere" forges documents to help out his books, the honest man knows so well that his books will be wrong, that he will lie in prison sooner than accept the office. An expenditure is frequently incurred, not provided for in the "stato discusso," or budget of the previous year; as for instance, a regiment is unexpectedly marched through, or billetted upon, a commune; the sindaco gives orders that the necessary provision be made, and the duty of finding the means devolves on the cashier; if he is positively unable at the moment to pay, he is subject to being maltreated, if not murdered, by the soldiers; if he does pay, raising the money by pledging his property or in any other way, it is highly probable that some years afterwards the camera dei conti will disavow the expenditure. In this case he has to petition the King for a special order, which acts as a release, called "Sanatoria," which he may perhaps get after he has been ruined. This may sound like an exaggerated sketch, and my informant, though most temperate in character and language, was certainly no friend of the Government; but the following specified fact will show that the amount of mismanagement and consequent hardship needs no colouring. The average number of petitions for a "Sanatoria" annually presented by different "contabili," *i.e.*, persons accountable and unable to pass their accounts, at the office of the Minister of the Interior, is not less than from 700 to 800.

All such petitions are sent from thence through the whole round (*see* Appendix) to the Sindaco, Decurionato, Intendente, &c., back to the Council of State and the King; so that the unfortunate suitors have to wait long for a decision. Some of these persons, doubtless, are dishonest, others honest; but on either supposition the fact is equally significant. Eight hundred public defaulters from offices compulsorily imposed, seeking, by a mixture of inquiry and favour, a remission of their debts to the public, present us with the striking result, *en masse*, of an undefined amount of disorder, fraud, and tyranny. The system of public works is detailed in the Appendix, but one or two facts may here be quoted in illustration of it. Mr. Keppel Craven was anxious to construct a fountain at his own expense for the benefit of the commune in which he resided, but found it utterly hopeless, on account of the endless applications to be made before the work could possibly be begun. In another case 8,000 ducats were left by will for the construction of an aqueduct for public use: in the end of 1847 three years had elapsed since the money was so left; 3,000 ducats had been spent in surveying expenses by the royal engineers, and the work was not yet begun.

The natural result of a long series of such cases is, that the inhabitants of any commune in the kingdom of Naples are so accustomed to consider the announcement

announcement of any new project for a public work as a mere pretext for additional and fraudulent exactions, that they are invariably and obstinately opposed to any proposition of the kind whatever.

The materials from which I have drawn the preceding account of the Italian municipal systems, were as complete as I could collect in the course of a journey through Italy, interrupted only by a few days' delay at each of the capitals. The Lombard system I have not introduced, as I had no opportunity of making any personal inquiries upon the spot into its workings. It is generally admitted to have been well administered, and there is no doubt that primary education in particular is greatly advanced in Lombardy beyond the point which it has reached in the other Italian States.

The first object with which the information was obtained, was the possible application of some parts of these systems to Malta, or at least the deriving some hints to aid in the construction of a system for that island. In this view I am disposed to fear that there is little probability of advantage arising from the collection of these materials. It would, indeed, be easy to adopt the forms and names of one or other of the Italian systems, or to form a modified system based upon all, and to give plausible reasons for introducing it into Malta. It might be made to look as well on paper as the Neapolitan system itself, and to work much better in so far that the absence of flagrant abuses, corruption, and injustice, could be secured by active and honest superintendence. But I have serious doubts whether any such system, or any municipal system at all, would work to the advantage of the people in the present state of Malta. Most of the systems examined were directly intended to be, and all have hitherto become a machinery for Government rather than a means of protection for popular rights. In Malta such bodies are superfluous as machinery, and might be hurtful as centres of agitation, from the want of other legitimate employment. It would in fact be something of a problem to devise duties for the municipalities, were they were once constituted. I have already explained my view of this difficulty in a paper sent home with his Excellency's Despatch, on the proposed formation of the council, part of which I beg leave to transcribe.

"In the greater part of Italy, the prevalent system is a modification of the French system, of which the object may be stated to be the combination of a wide-spread system of local government, with the most perfect centralization. These institutions are a machinery constructed at least as much to secure centralized inspection as local independence. In Malta centralization is unavoidable from the very nature of the case. The size of the country makes a great subdivision of powers difficult to bring about, and certain to be injurious if effected. The French system presupposes a large country and a great variety of interests to be subjected to uniform central control; in Malta the tendency of everything, morally and materially, is towards the Government; unity is more natural than subdivision, and I do not think it improbable that the creation of separate self-governing communities would have the effect of increasing the complication, and therefore the expense of the machinery of Government.

"A department of public works, for instance, is essentially connected with the Government of Malta; it would be impossible to shift, more than partially, upon the municipal bodies, did such exist; and the result of a partial transfer would be to create a double system of administration, and substitute to the same extent weak and therefore wasteful action for singleness and vigour. And without denying that in Malta there is a real wish for the admission of something popular into their institutions, I confidently assert the absence of that democratic enthusiasm which will bear up contentedly against the results of an expensive experiment."

"Voluntary contributions to a fund for parochial purposes has been suggested as the basis of a constituency, but it is most probable that any scheme based on this would fall to the ground, or rather never come into action at all, from the universal unwillingness of the people to contribute. A constituency, however, based upon rent would probably be feasible, with more or less trouble; the question which would create practical difficulty would be, what are to be the funds administered by the municipalities. To expect them to raise any voluntary additional taxation for the purposes of local improvements, is out of

the question. If taxation to the average amount at present expended upon these local objects were remitted, the result would probably be, not that the same sum would be raised by local taxation and better spent, or the same objects accomplished for less expenditure, but that a much less sum than the present would be raised with more feeling of hardship, and expended less to the general satisfaction. The people are so much in the habit of looking to the Government for the initiative of every step to be taken, that it would be long before they appreciated the boon, even coupled with a slight diminution on imports, of being thrown upon their own resources for any local improvements or repairs."

There remains the course noticed in his Excellency's letter, that of placing in the hands of the municipal bodies a portion of the revenue. It is unnecessary to observe how essentially different such a course would be from that of creating self-taxing communities. It is almost incompatible with the principle of municipal independence to have the whole fund administered by the local authority come from the public revenue. It reduces the pecuniary interest of the municipal body simply to obtaining from the Government as large a share of the public money as it can. In the administration of these funds, moreover, the interference of the Government would be very generally necessary, not merely as Government, but from its local interests as the proprietors of one-third of the property of the island, and this would much increase the difficulty of giving to municipal bodies anything like "independent action." It may be added that, in such a case, there would be a greater jealousy of the necessary supervision of the performance of the municipal duties, than exists at present of the exclusive performance of them by the Government officer. The duties of a municipal body, were such constructed, would be more important in Valletta, and the other cities, than elsewhere, and in Valletta it would be more than elsewhere necessary to provide the possibility of the overruling interference of Government in case of necessity. I do not speak merely of the position of Valletta as a fortress, though that consideration, in contemplating the introduction of any local authority distinct from the English Government, can never be forgotten. But in a sanitary point of view alone, I positively assert the necessity of an active supervision and control on the part of the Government. The condition of Valletta, in these respects, is not perfect, and active measures have been and are taking for its improvement; measures which, like those elsewhere, suggested by a temporary alarm, may be expected to leave behind a permanent benefit. But such as Valletta is, it is, for cleanliness and care of public health, the model and wonder of the Mediterranean. "Bella Citta la Valletta, e cosi pulita!" is the constant and comparatively deserved exclamation of the admiring Sicilian, or South Italian visitor. The name of an independent municipality would be a poor exchange for the degradation, in this respect, to the rank of a Sicilian or Italian town, and, without active surveillance, I think such a degradation would not be improbable. In fact, there are at Malta so many points at which municipal and, so to speak, State purposes cross and are intermingled, that their separation would be difficult, and often attended with disadvantage. The construction of such a system would be working not with, but against, the tendencies of things; in other states, men have constructed a great many separate units into one political body; in Malta we should be breaking up a natural unity into artificial divisions.

It may be observed that there already exists in Malta an officer invested with the name, and some of the functions, of the Italian sindaco. The country is divided into seven districts, to each of which the Government appoints a sindaco, taken from the class of advocates charged with the preservation of the peace, with reporting occurrences to the police and Government, with removing obstructions from the roads, &c., and with jurisdiction over cases where a small amount is at stake. His duties are thus detailed in the Blue Book:—

1. As civil magistrate, to hear and determine, in a summary way, all civil causes not exceeding the amount of 2*l.* 1*s.* 8*d.*, where the defendant is resident within his district.

2. As officer of police, to attend to the conservation of the peace within the limits of his district, and to the apprehension and detention of offenders.

3. As

3. As head of the district, to report immediately all extraordinary occurrences to Government, to make weekly and monthly reports on the state of his district, and a detailed report, every six months, stating the actual population, the cultivation and produce of lands, &c. He is also to watch over the markets, inspect from time to time all scales, weights, and measures, and report any contravention of the market regulations to the inspector of police. He is, moreover, to be careful that the streets of the casals in his district, and the roads around them, are kept clear of building materials, &c.

These duties, it will be seen, are mainly executive, and in part judicial. There are no funds for the sindaco to administer. It will be clear at a glance that it would be highly inexpedient, or rather impossible, to convert this office into an elective one, so long at least as magisterial duties are connected with it. To attempt a separation of the one portion of his duties from the other, and place the one in the hands of a person elected by the inhabitants, and the other in the hands of a nominee of the Government, would be liable to the fatal objection of employing two persons to do what can be done better by one. The present position of the sindaco, however, makes him the natural channel of communication between the Government and the district over which he presides for any purpose in which its interests are specially concerned. A recent minute of his Excellency the Governor, of which the object is to define the duties of the office of superintendent of public works, now constituting a separate department from that of the land revenue, contains an illustration of this. The superintendent is therein directed annually to communicate with the sindaco on the subject of the works requisite within his district during the following year, the sindaco is to assemble the proprietors of his district, and prepare, with their advice, a list of the roads, streets, sewers, &c., that require to be opened, improved, or repaired, upon which statement the superintendent will report to the Government, recommending for execution such parts of the works suggested as may be within the sum applicable to be expended in the district. The sindaco is afterwards charged to certify the execution of the works authorised by the Council.

This step places at once in the hands of the inhabitants of the country districts a certain amount of power. They can represent the manner in which their interests are affected by any designed work, and suggest others. It would not be difficult to frame some fair and convenient scheme, according to which it might be the duty of a sindaco to ascertain the general wishes and interests of the proprietors, and indeed some such scheme is almost presupposed by the minute. Such a scheme, which should be of the simplest possible description, I believe to be the utmost extent to which municipal reforms could at present be introduced in Malta to advantage. While they have not in their own hands the funds from which the improvements or repairs are to be made, they cannot, in the nature of things, exert over their disposition a direct and positive authority. For the reasons above stated, it would be, in my opinion, highly inconvenient and inexpedient to set up a regular system of local corporations, and hand over to them the public money, to be expended for local purposes. The Government must necessarily apportion the sum for the wants of each district; it must also overlook, as Government, the expenditure of public money, and in a state of things so centralized as that which by the necessity of nature exists in Malta, to overlook is to manage, or to waste upon two inefficient establishments more than the money which would support one in efficiency.

If, indeed, the habits of considering the objects and means of local improvements should gradually create a willingness to aid them by voluntary contribution, the case would be altered, and the inhabitants of every district would have a right to control the expenditure of money given by themselves for their own separate benefit. This result, however, I do not expect to witness.

APPENDIX.

NAPLES.

PENINSULAR Naples is divided into 15 provinces. Every province is divided into districts, some into four, others into three, one into two. There are in all 53 districts.

The provinces and districts, although equal in rank, are divided into three classes.

At the head of each province is an Intendente, appointed by the King, either *proprio motu*, or by the proposition of Minister of the Interior; he retains his office at the will of the Sovereign.

The Intendente is under the immediate control of the Minister of the Interior, but corresponds directly with all the other ministers in affairs belonging to their respective departments. He is at the head of the civil and commercial administration of the province generally in all matters connected with finance; all relative to the "alta polizia," or secret police of the state, being the prefect of police for the province; he has to superintend the publication of all laws, decrees, and ministerial acts; all complaints or wants of the communes are submitted to him, and through him, in the cases in which his own authority is not competent, to the King. The gendarmerie, and all other bodies of provincial police, are at his disposal, and the commander of the regular troops is equally bound to act on his summons; so that the two branches of judicial and executive authority converge and meet in his person.

The Intendente is generally selected from the civil service; if a military officer, which is rare, he ceases, *durante officio*, to hold military rank, and to enjoy the emoluments of the same.

The Intendente takes precedence of all other functionaries of Government within the bounds of his jurisdiction, both judicial and military, except in case of an "*alter ego*."

The Intendente is obliged to visit every commune in his province once every two years; before going, he is obliged to give notice to the ministers of the central government of the day he intends to proceed on his visitation, in order that they may direct his attention to any particular object.

The Intendente is President of the Council of Intendenza, and in case of parity of votes, the side on which he votes prevails. He is the President of the "Consiglio degli Ospizii," in which his voice has the same preponderance.

	Salary.	*Ducats.*
Intendente of Naples		4,400
Of any other province:	of 1st Class	3,600
„ „	of 2nd Class	3,300
„ „	of 3rd Class	3,000

The Segretario Generale.

The next authority in the provisional government to the Intendente is the "Segretario Generale," also appointed directly by the King, and removable at the royal pleasure. This functionary countersigns the signature of the Intendente, which is otherwise not legal. He is the keeper of the official seal. He sits in neither of the councils above mentioned. The archives and correspondence of the province are under his superintendence. In the absence of the Intendente he occupies his place in all respects, save as President of the "Consiglio d'Intendenza," and that "degli Ospizii," in which he takes no part. He reports on the state of the province during the Intendente's presence, and generally all the business passes through his hands.

	Salary.	*Ducats.*
Segretario in Naples		1,300
Of any other province:	of 1st Class	1,100
„ „	of 2nd Class	1,000
„ „	of 3rd Class	940

Consiglio d'Intendenza.

All questions regarding property, roads, boundaries, &c. &c., which may arise between commune and commune of the same province, or between commune and individual, or between two individuals affecting a communal right, or regarding rivers, canals, public domains, or any act or contract of the public administration, are referred, in the first instance, to the Consiglio d'Intendenza, from the decision of which there lies an appeal to the "Gran Corte dei Conti," at Naples; the decision of the "Consiglio d'Intendenza" is carried into effect unless there be an appeal at the end of three months, when the decision is against the individual, or at the end of six months, when against the commune.

The decision of the Court of Accounts at Naples must be ratified by the King before it can be executed.

The defeated party has power to petition the King before the ratification, to send the papers

papers to the "Consulta di Stato."* The decision of the "Consulta di Stato" is called "Avviso." This "Avviso," with all the documents, goes to the "Consiglio di Stato." In the Consiglio di Stato, the case is expounded by the minister whose department the question principally regards. The decision of the "Consiglio di Stato" is reduced to writing in the shape of a Minute by the minister exponent, and signed by him, after which it is forwarded to the Court of Accounts, the sentence of which is thereby either approved or modified, but never simply negatived.

All trustees (Contabili) of communal, provincial, or charitable property, and public domains not crown lands, have to submit their accounts to the Consiglio d'Intendenza at the end of the year, or within three months thereafter; but there are often arrears in this scrutiny on account of the great amount of business, the verification being vexatious and too particular.

The account is approved, or the Contabile is condemned to make good any mismanagement, defalcation, extravagance, or mistake.

The decision of the Consiglio is final in the examination of the accounts presented by the Contabile in a commune whose *stato discusso* is not to be approved by the King; (to wit, whose ordinary income is less than 5,000 ducats), unless the Contabile demands an appeal and revision, in which case the affair is brought before the Court of Accounts, Consulto, and Consiglio, as above; but all accounts presented by the Contabile in a commune of 5,000 ducats income and upwards, or regarding public domain and provincial property, or those presented by contractors, must in all cases go for a second scrutiny to the Court of Accounts, where they have their final solution, unless the Contabile demands an appeal, which then goes to the Consulto and Consiglio as before. But the decision of the Court of Accounts is summarily carried into effect in the meantime.

The Consiglio d'Intendenza has also to ratify or modify, or reject the local budget of every commune (the *stato discusso* every fifth year, and the *stato di variazione* yearly), before it is submitted to the King or to the minister.

The Consiglio d'Intendenza examines and approves all contracts for public works and supplies, local or imperial.

The Consiglieri are five in the provinces of 1st class; four in the provinces of 2nd class, and three in 3rd class. There must be at least three Consiglieri present to constitute a meeting. They are appointed by the King, as much as possible from the class of landed proprietors of the province. No qualification is required, except such as is necessary to the exercise of all civil functions.

The Consiglieri receive, in Naples, 700 ducats a year; in any other province, 500 ducats, and enjoy certain fees. They are assisted in council by certain assessors called "Razionali," who present the documents and make explanations, but give no opinion or vote. They do not, in general, exceed in number the Consiglieri.

Segreteria d' Intendenza.

There are several inferior clerks to transact the business of this office.

	Ducats.
For the Segreteria of the Intendenza in Naples are given -	9,600
For Terra di Lavoro - - - - - - - -	6,600
For Principato Citeriore - - - - - - -	4,500
For 2nd class - - - - - - - - -	4,000
For 3rd class - - - - - - - - -	3,400

Consiglio degli Ospizii.

The Consiglio degli Ospizii is composed of the Intendente as President, the bishop of the diocese, three councillors, and a secretary. The Consiglieri are appointed by the King among the proprietors of the chief town of the province.

The business of this board is to examine the accounts of the charitable institutions of the province, and to exercise a general power of appointment and surveillance in the same.

Consiglio Provinciale.

The Consiglio Provinciale is composed of 20 members in the provinces of 1st and 2nd class, and 15 in the provinces of 3rd class, selected among the most accredited proprietors of the province, the King appointing them for four years, out of the names given by the Decurionati of the communes of the province.

The "Consiglio Provinciale" meets generally in May for 20 days. The president is appointed yearly by the King, not from the number of the council. He is sworn in either before the Minister of the Interior or the Intendente of the province.

At the discussions of the "Consiglio Provinciale," the public are admitted to hear the President's opening speech; and if the council choose, even the whole discussion. The voting is open. The "Consiglio Provinciale" examines the papers of the "Consiglio Distrettuale" and "Conto Morale" of the Intendente, which is a general summary of his administration during the previous year; it also receives and considers all miscellaneous petitions and representations on the part of public functionaries or communes.

This council passes an approval or a censure on the conduct of the Intendente, on the use and disposal he has made of the provincial funds, on the conduct of all the high judicial officers, on the military commander, and others.

It proposes the construction, or suspension, or alteration of all public works and roads, except

* This is a body containing 15 or 16 members, to whose opinion the Crown refers different cases. They have no authority to back their opinion.

except in the case of communal roads made at communal expense, which are sanctioned solely by the Minister of the Interior.

The "Consiglio Provinciale" prepares the budget of provincial taxation for provincial objects, either by suggesting "Grani addizionali" to the land tax, or by proposing a new impost, the latter expedient being very rare, and in either case the proposal must be approved in the "Consiglio di Stato" at Naples by the King, on the proposal of the Minister of the Interior.

The "Consiglio Provinciale" have also authority to appoint one or two deputies, who, in the intervals of their session, shall urge their proposals on the attention of the Minister of the Interior and the King.

But the influence of these deputies is as illusory as that of the council itself, for in practice the Intendente of the province, shortly before the meeting of the council, gives its president a written instruction of what they are to do; and if they make any proposals of an independent character, which are entrusted to the care of their deputy at Naples, the latter is neglected and repulsed with ignominy by the officials of the interior, and perhaps at the end of six months is dismissed from the capital by the police, his documents being subsequently sold by public auction as waste paper.

The District.

Sotto Intendente (his salary is equal to that of the Segretario Generale).

The District.—The head of the district is the Sotto Intendente, excepting in the district where the Intendente resides. Within the district he represents for every administrative purpose the Intendente; is the chief of the police, transmits to the communes the orders of the Intendente, and reports to the latter their state, their wants, and transmits every proposal for improvement of roads, &c. He appoints from five to six subordinates, "Capi di Sezione," who transact the ordinary business of his office, which is called Segreteria di Sotto Intendenza, and to which are assigned 900 ducats a year in some districts, and 800 in others. He is appointed by the King; his pay, besides fees, 60 ducats a month; his office is held at pleasure. His functions may be said to be strictly representative of those of the Intendente.

Consiglio Distrettuale.

Consiglio Distrettuale.—The Consiglieri Distrettuali are appointed, in the same manner as the Consiglieri Provinciali, by the King, on the names given by the Decurionati. They are 10 in number, besides the president; meet once a year for 15 days, and their meeting must be over before that of the Consiglio Provinciale begins. Their functions are for the district similar to those of the provincial council for the province. They prepare, in regard to the district, the material for the provincial councils; they divide among the communes of the district the land-tax according to modifications of the year. Their accounts and proposals are subsequently submitted to the Consiglio Provinciale, as above mentioned.

The president is yearly appointed by the King. The Consiglieri hold their office four years.

A Commune.

Communes are of three classes:—1st, 2nd, and 3rd class.

1st class, when there are 6,000 inhabitants, or where the Intendente, or a court of appeal, or criminal court, resides, or have an average income of 6,000 ducats a year.

2nd. Where there are from 3,000 to 6,000 (immediately on becoming 6,000 a commune can, on application, pass into the first class), or where the Sotto Intendente resides.

All other communes of the 3rd class.

These rules, however, do not universally apply; for instance, a commune, neither in population nor income above the 3rd class, but with large charitable funds, may by the Government be raised either to the 1st or 2nd, thereby giving the Government greater and more direct power by the immediate nomination of the communal officers.

A commune may consist of any number of villages; some have as many as 24. A village having at least 1,000 inhabitants, and a sufficient income for its own purposes as a commune, has a right to petition the Government to be erected into a separate commune. The course is to petition the Intendente, who submits the request to the Consiglio d' Intendenza, whose advice, with the papers, is transmitted to the Minister of the Interior, and by him to his Majesty for final decision. On the other hand, a separate commune, having less than 1,000 inhabitants and insufficient income, may petition, in a precisely similar manner, to be annexed to a neighbouring commune.

Lista d'Eligibili.

Lista d'Eligibili.—This list, comprising those eligible to office for the communes, for the district council, and for the provincial council, is made out by the Sotto Intendente in the course of the year, and exposed for a month, during which time any one complaining either of being inserted or omitted may petition by "*reclamo*," addressed to the Sotto Intendente, who at the end of the month submits the list and "reclami" to the Intendente, who, after taking the opinion (avviso consultivo) of the Consiglio, finally decides on the list. He then sends the list for each commune to the Sindaco, who deposits it in the Decurionato.

For the communes of the 1st class, the qualification for this list is at least 24 ducats income from land, or the exercise of some one of the "arti liberali," and in both cases five years' residence in the commune.

For those of the 2nd class, an income from land of 18 ducats, or keeping a shop, or exercising a trade, and the same condition of residence.

For those of the 3rd class, an income of 12 ducats from land, or a lease of whatever value,

value, or the holding of land by census* (emphytensis), and the qualification of five years' residence.

The disqualified are foreigners, servants, ecclesiastics, and all who by special laws cannot be in the list; as, for instance, a general in the army, a high judicial authority, &c.

From 21 to 70 years of age is the practical rule of admissibility.

The officers of the commune are,—

1. Sindaco.
2. Eletti.
3. Cancelliere Archivario.
4. Cassiere.
5. Decurionato.

Sindaco.

1. *Sindaco.*—The Decurionato, from the list of Eligibili, submits a "Terna" to the Intendente, who, in the case of communes of 3rd class, and of 2nd where not the residence of Sotto Intendente or Civil *Tribunal*,† selects one, which selection is final. If the Intendente rejects the terna, and another is sent, which he also rejects, he must then apply to the Minister of the Interior, who nominates from the list.

For communes of 1st class or 2nd, where the Sotto Intendente resides, the "Terna" is sent to the Minister of the Interior, and the King appoints the Sindaco. He can, at pleasure, either require another terna, or at once appoint any other person to be Sindaco. The Sindaco must not be one of the Decurionato; he must be 25 years of age; he must not be nearly related (as, father and son, nephew and uncle, or brothers) to the *Cassiere Cancelliere*, or either *Eletto*; acceptance of the office is compulsory; age above 60 is an apology. A lawsuit against the commune, any outstanding public accounts with the commune, or residence out of it, also operate as exclusions. He holds office for three years, can be confirmed (by the same proceeding) for three years more, but can in this case decline at pleasure. After these six years he must remain three out of office. The office is gratuitous; the single privilege is, he need not (*sic*) for a sporting license, about four ducats a year.

Sindaco, his powers and attributes.

The Sindaco is the first authority in the commune, under the direct orders of the Sotto Intendente; with the assistance of the Eletti and the Decurionato, he is charged with the administration of all communal business. He presides in the Decurionato; disposes of the income of the commune according to the "*Stato discusso*," sending an order for every payment to be made by the *Cassiere*. He is charged with the promulgation of all new laws; he is obliged to report frequently to the Sotto Intendente on the state of the commune (in every respect, economical, moral, &c.), and the condition of any public establishments in it; he is the "Uffiziale dello *Stato Civile*," *i. e.*, registrar of births, marriages, deaths (with a memorandum of baptisms); the civil contract of all marriages must be made before him; deaths must be registered, with all circumstances, within 24 hours. For anything relating to the Stato Civile, he corresponds immediately with the Procuratore del Re, who, about once a year, visits each commune, and inspects the Registro dello Stato Civile; if this is not according to the civil law, he can fine the Sindaco and Cancelliere. The Sindaco is *Commissario di Guerra* for the commune, sees to the quartering and furnishing of troops; every officer passing through the commune must be *en rapport* with him.

Conto Morale.

At the end of January he must render the "Conto Morale" of his administration to the Decurionato, which, under the presidence of the oldest Decurion, considers and reports on his conduct. The Conto Morale, with their observations, is then submitted to the Sotto Intendente, and by him, in due course, to the Intendente, who finally pronounces on it. If the Intendente's decision is complained of by the Sindaco, the latter can address to him a "*reclamo*," which is sent with the papers to the Minister of the Interior for his decision.

The Eletti.—Age, qualifications, time, and mode of appointment, and of holding office, and exemptions for the Eletti identical with those of the Sindaco.

1st Eletto.

The 1st Eletto has the following duties: the charge of the "*Polizia* Urbana and Rurale," distinguished entirely from the criminal police; everything connected with the markets, weights and measures, hours of opening and shutting shops; regulation and appointment of time for the celebration of public festivals or amusements; construction of new buildings; cleaning streets, sanitary measures in general, prevention of obstructions; and in the country, appointing time for burning the stubble, or ordering precautions against any public evil, as a flight of locusts, inundations, &c., comes under his surveillance, and he can fine in any case of contravention of the existing regulations. If a road or pathway is shut up to the injury of the public, he can cause it to be re-opened *ad interim*, until the question of right, if there be such, is legally decided. This office corresponds very exactly to the *Ediles* of the Roman Empire. Every day the 1st Eletto goes to the market, and fixes the market price for all articles of food.

In cases of contraventions beyond his authority, he can only draw a *procès-verbal*, and the matter is referred to the Consiglio d'Intendenza; as, for instance, in case of the introduction,

* Land is held by Census when let permanently, at a rent, with obligation to improve; in case of violation of the terms, the original proprietor can re-enter; but the tenant, so long as he satisfies the conditions upon which he was admitted, cannot be ejected, and, in fact, is to all intents the proprietor.

† Practically this does not come into working; the Tribunal is always in the same town with the Criminal Court, the presence of which, as before mentioned, constitutes a commune of the first class.

duction of corn or other provisions into the town contrary to the laws for the payment of duty. In this case the interest of the *Gabelliere*, or farmer of the revenue, is evidently prejudiced to an extent on which the Eletto cannot decide. The 1st Eletto, who resides in the same commune with the "Giridire di Circondario," exercises in his court the functions of Ministero Publico.*

2nd Eletto. *2nd Eletto.*—In the absence either of the Sindaco or 1st Eletto, he fills the place of the absent officer.

Cancelliere Archivario. *Cancelliere Archivario.*—Appointed by the Intendente upon the "Terna" submitted by the Decurionato, if the terna is rejected, the same course is followed as in the case of the Sindaco; office for life. He takes care of the archives, registers, draws the acts of births, &c., keeps the books of the Stato Civile, the seal of the Sindaco, gives out and seals and countersigns any document required from the Sindaco. The salary is 20 ducats for every 1,000 inhabitants in the commune; but he cannot receive less than 24, nor more than 200.

Cassiere. *Cassiere.*—Appointed as the Cancelliere, for three years, but renewable at pleasure. After 60 years of age the appointment may be declined. The Decurionato is *responsible* in a pecuniary view for the conduct of the Cassiere. He collects the income and makes the payments of the commune, in conformity with the orders of the Sindaco and "Stato discusso." He has to give the guarantee, either in land or public funds, proportionate in value to the importance of the commune. The guarantee must be approved by the Decurionato and Consiglio d'Intendenza. In case of deficiency of money to meet current or extraordinary expenses, the Cassiere is bound, upon the Intendente's order, to advance up to 500 ducats, for which he receives interest at the rate of 1 per cent. a month. The first incoming is applied in payment of the advance. He receives, in communes with less than 600 ducats income, 5 per cent. on the income; in communes between 600 and 3,000, 40 ducats a year; between 3,000 and 5,000, 60 ducats; between 5,000 and 7,000, 100 ducats; between 7,000 and 10,000, 120 ducats; and between 10,000 and upwards, 140 ducats.

In the first week of March he must present to the Sindaco the "Conto Materiale," or account of his payments, who, with the aid of the Cancelliere, compares his account with originals in the archives, and certifies their agreement; then sends the account to the Intendente, who lays it before the Consiglio d'Intendenza, by whom, in the case of communes which have less than 5,000 ducats yearly, it is finally pronounced upon, excepting that the Cassiere possesses the right of appeal, as above described, in the case of the Sindaco. For communes with 5,000 ducats and upwards, the accounts pass a step higher, to the Gran Corte dei Conti in Naples. He is bound to show that he has *done his best* to collect the revenue, and has made all payments according to the order of the Sindaco, and the "Stato discusso." If the Corte dei Conti finds that the Cassiere has made what they consider a wrong payment, he has to refund it, and his only remedy is a civil suit against the Sindaco, in which, subject as it is to appeal upon appeal in the manner already described, his success is at any rate doubtful and certainly distant.

Decurionato.—The Decurionato is the representative body of the commune. For communes of the 1st class, or of the 2nd, when it is the residence of the Sotto Intendente (*or of the tribunal*), they are nominated by the King, selected from "Terne" submitted to him by the Intendente. If the Intendente rejects two successive Terne, the application is then made to the Minister of the Interior, as in the case of the Sindaco. For the other communes they are similarly nominated by the Intendant from the "Terne," presented to him by the Sott' Intendente. In communes of 1st or 2nd class, three decurions are nominated for every thousand inhabitants; the whole number, however, is not to exceed 30; in those of the 3rd class the number is from 8 to 10. One-fourth goes out every year, so that the whole is renewed in four years; the members must be 21 years old; after 70 they are excused. Debtors of the commune, any who are at law with the commune, any who have outstanding accounts with it, who reside out of it, or are related in the degrees above stated to any existing member, are excluded. A third at least of the body must be able to read and write.

The same persons may be selected as members after two years' interval.

The Decurionato considers the "Stato discusso" proposed to it by the Sindaco, and agrees upon the one to be presented, and settles, subject to the approbation of the Intendant, the "grani addizionali," and duties upon consumption to be exacted to meet the expenses of the commune. It considers, as before stated, the "Conto morale" of the Sindaco, and refers it with its own report to the higher authorities. The trial or acquisition of any right or claim, the entering into or dissolution of any contract of whatever nature regarding communal property, as investing surplus funds, leasing land, &c., form subject for the deliberations of the Decurionato, as does, generally speaking, every matter in which the public interest of the commune is concerned. The Decurionato nominates the "Terne," out of which the Sindaco, Eletti, Cassiere, and Cancelliere are to be selected; also proposes, not

* In every court, from the lowest to the highest, there is an officer acting as what is called "Ministero Publico" (under different names in the different courts); that is, demanding on the part of the King the execution of the law, requiring that the sentence to be passed should be such and such; acting, in fact, as public prosecutor. In all civil cases even he has the right of giving his opinion, but in practice he frequently, without interposing any suggestion, leaves it to the court to decide, except in cases where women, lunatics, minors, or public possessions are concerned . . . . The "Giridire di Circondario" decides in minor criminal cases; in the most trifling, without appeal; in civil cases, without appeal, to the amount of 20 ducats; with appeal, to the amount of 200.

not in "Terni," those considered fit members for the provincial and district Consiglieri *as above*; two-thirds are requisite to form a meeting, and a majority of votes decides. Every deliberation must be signed by those who are able to sign it. Every member can place on record what his own vote was. Properly speaking, the Decurionato meets on the first Sunday of every month. It can also be called together by the Intendant, Sott' Intendente, or Sindaco, who gives notice of meeting; the discussion is carried on with closed doors, the voting is open; no resolution resulting from the deliberation can be carried out without the approbation of the Intendente, who has the power of sending back the decision to the Decurionato for reconsideration. If the Decurionato persist in their vote, it is the duty of the Intendente to transmit the whole case to the Minister of the Interior for his decision. It selects its secretary from among its own members, and has the nomination of every other agent or employé of the commune. The "Terne" drawn out by the Decurionato remain exposed for eight days, during which anyone has a right to submit to the Intendente his objection either to the omission or insertion of any name (by "reclamo").

The "Regolamenti della Polizia urbana e rurale," varying to a certain extent in the different communes according to their peculiar local circumstances, are once in every five years revised and drawn out by the Decurionato, *under the presidency of the Sindaco*; the project of regulations formed by them is transmitted to the Sott' Intendenti, who sends them with his observations to the Intendente, who, after discussion in the Consiglio d'Intendenza, either approves or modifies them, and sends them back to the Sindaco, whose duty is to promulgate the notices of them for 14 days. If the Decurionato and Sindaco object to the modifications of the Intendant, the case is submitted to the Minister of the Interior for final decision. The Regolamenti can inflict for any "contravenzione," besides payment of damages, up to three days' imprisonment, and six ducats' fine.

The Decurionato has also the charge of appointing officers called "Guardiani urbani e rurale," charged with watching over the performance and noticing the infringement of any of the regulations of the Polizia urbani e rurale. They are approved by the Intendente, and empowered by him to carry arms; they can arrest offenders taken in the act (for causing obstructions, &c.); their number and pay varies in the different communes.

When a conscription is ordered, the Decurionato meets in permanent session till the business is completed, with the assistance of the Sindaco, the Cancelliere, and the Parroco of each parish composing the commune, to make out the list of persons subject to the conscription. On another day (appointed as the former by the Intendant) they meet for the drawing the lots of the conscripts, first considering and deciding upon all petitions and objections which have been transmitted to them. The list of those drawn, with the proceedings, is sent to the Intendente, who, with the assistance of the Consiglio di Conscrizione, decides on any objections made to the decisions of the Decurionato.

Whenever any question rises with regard to the imposition of the land tax upon any individual or commune (respecting either excess or deficiency), the Decurionato first considers and gives an opinion on it; the case is then transmitted through the Intendente to the superior authorities.

The Intendente has the power of suspending for one month any officer or member of the communal administration (from the Sindaco downwards), but not of entirely removing him without the express permission of the King, given at the requisition of the Minister of the Interior.

All the officers,* from the Intendente downwards to the Eletti, are guaranteed by law against any proceedings or prosecution for any act committed by them in their official character. This guarantee lasts after their office has ceased, and cannot be removed except at the pleasure of the King, when a petition to institute proceedings against any such officer has been presented through the Minister of the Interior.

The Decurionato also makes the project of the "proventi guirisdizionali," which is approved or modified by the Minister of the Interior.

Provincial Expenses.

The expenses may be distinguished into those which are common to all provinces, and those which belong to particular provinces.

The expenses of common character are:—

1st. Those of "Casermaggio," that is, providing barracks, and a small amount of furniture, for the gendarmerie stationed in the province, and for every other description of public force.

2. The expenses of public instruction, with the exception of the primary schools, and of the University of Naples.

3. Those of statistical information.

4. Those of enforcing vaccination.

5. Those of the support of foundlings.

6. Office expenses of the Segreteria Generale, Intendenza, and Sotto Intendenza.

7. House and furniture of military commandant of the province.

Those

* Intendente, Sott' Intendente, Segretario Generale, Consigliere d'Intendenza, Sindaco, Eletti.

Those varying in particular provinces :—

1. All expenses of making or keeping in order the provincial roads, and all buildings for public purposes.

2. Expenses of the Societá Economica, or society intended for the encouragement of agriculture and commerce, of the provincial libraries, and other educational establishments.

3. Furnishing or renewing furniture of houses of Intendente or Sott' Intendente.

Income.

The common expenses are met by an additional imposition to the land tax, the amount of which is settled once a year for every province by the King, on the data sent up through the Minister of the Interior by the provincial councils, in the form of " Stato discusso " for the coming year.

The particular expenses are also paid by an additional imposition on the land tax, which is fixed by the Consiglio Provinciale, and approved of as above. This cannot exceed two grani addizionali for each ducat of the original land tax.

i.e. 2 per cent.

For extraordinary expenses, however, of construction, &c., the Consiglio Provinciale may impose (without limit) more than two grani per ducat, subject to the approbation of Minister of Finance, and even impose a *ratizzo* or proportional duty on the income of the communes, with the approbation of the King, and the Minister of Interior. The " Stato discusso," containing the proposed expenditure, and means of meeting it, is presented to the King for approbation ; the revenues are administered according to it, as finally approved, under the direct control of Minister of Interior. The Consiglio Provinciale may appoint a Cassiere or other persons to watch the expenditure ; but the persons who direct it are actually nominees of the Minister, who may, however, adopt the Cassiere proposed by the council. The revenue derived either from *addizione* or *ratizzo*, is paid by the receivers to the Receiver General of the province, who holds it at the direct disposition of the Minister of Interior for purposes stated in the " Stato discusso."

A result of this system is, that when a province has raised for public works of a strictly local character, by any or all of these means, a large sum, which has been placed in the hands of the Receiver General, an order comes down from the Minister of the Interior, to pay the sum into the Treasury at Naples. The Receiver cannot refuse, and the sum thus raised for local, is applied, in fact, to Imperial purposes, and no redress can be obtained.

The Intendente presents to the Consiglio Provinciale the account of the use of the public revenue, and the Cassiere presents to the Consiglio d'Intendenza his " Conto materiale." The production of a " ministeriale " or order, referred to above, for any part or the whole of the sum, is accepted, without further question, in the audit of the accounts.

No contract of any kind can be entered into by or on behalf of the province, without the permission of the King.

Communes.—The revenue of each commune is divided into ordinary and extraordinary. The ordinary revenue is derived from five different sources:—

1. Fondi patrimoniali, *i.e.*, properties held by it strictly as private, and its public domain answering to common lands in England.

Censi, canoni and prestazioni, *i.e.*, the letting of land permanently, and all dues.

A considerable portion of lands is held under the communes, in the form of "census," in consequence of the confiscations of the feudal possessions of the barons at the time of the French occupation, when much of the land so obtained was divided among the poorer classes, on the condition of paying permanent rent to the commune.

When this source is not sufficient, as is nearly always the case, the expenses must be met by the—

2. Proventi giurisdizionali.—The produce of fines for contravenzioni, as above. Payment for Postifissi e volanti, *i.e.*, permission to occupy fixed or moveable stalls in markets or streets. Dritto di pesi e unisure pubbliche, *i.e.*, payment for examining weights and measures.

All these sources are fixed by the Decurionato.

3. Grani addizionali on the land tax (to the amount of two grani per ducat).

4. Dazj di consumo, duty on all articles to be consumed or sold in the commune (part of the Stato discusso), the amount at the discretion of Decurionato, subject to the approbation of higher authorities (though limited to a carlino per bushel for flour).

These duties may be exacted either by direct collection, by farming (appalto), or by a rate imposed on all the inhabitants.

5. Monopolies of the sale of particular articles of food, which are sold by auction (under the express permission of the King, rather rarely done), called " Privative volontarie e temporanie."

The extraordinary sources of revenue :—Surplus of the preceding year, any arrears paid up, any recovery at law, any credit falling due ; the money thus received must be employed again.

Expenditure.

Ordinary, extraordinary, and unforeseen.

Ordinary, are under five heads :—1. Salaries to persons in the municipal administration.

To the preacher for sermons during Lent (60 ducats in 1st class, 40 in the 2nd, 30 in the 3rd.

To a physician for the poor, 120 in 1st class, 90 in 2nd, 72 in 3rd (many communes have not this officer).

To the surgeon 100, 80, or 60 ducats.

To a master for primary schools, of which there is one in each commune, not more than 120, 80, and 50 (they get 30, 20, or 10, in fact).

To the schoolmistress, not more than 80, 50, and 30.

To the clock cleaner, 12 ducats.

Something to the sexton, the woman who takes care of foundlings, the sacristano and organists of the church of "Patronato Comunale," *i.e.*, the church, if there be such, of which the commune is patron.

Expenses of religious festivals, 40, 60, and 20 ducats, and of civil festivals, 40, 25, and 15.

2. The rent of the town hall when not property of the commune.

The rent of the house of the judge di pace for the circondario.

Of the school.

Of the gaols, if not communal property.

Of the "Rota," foundling hospital, where they are first received.

3. Collection of laws; all laws are sent, and they are forced to pay, as well as for a copy in each commune of the "*Giornale delle due Sicilie.*" Expenses of the office, for stationery, &c.

4. Land tax, *i.e.*, payment due upon the communal property, interest of debts.

Posta interna, *i.e.*, a system of letter communication between the villages of the commune, keeping in order, "mantenimento" from day to day, of all public works of the commune.

Roads, bridges, buildings, &c. Expenses of revision of accounts, as in the Consiglio d'Intendenza, or corte dei conti.

Of morning mass.

Of the caserma or barracks for the militia, and gendarmerie stationed in the commune.

Of lighting the town.

This expenditure is *permitted* only to communes of the 1st class, or those of the 2nd, where a Sott' Intendente resides.

5. One-twentieth of the whole communal revenue, applied to the maintenance of the military stationed in the province.

Supplemento di Congrua, or payment to the parson of the deficiency below the established amount in his salary.

Extraordinary Expenses.—The construction and repairing of public works of any sort.

Expenses of lawsuits incurred by the commune.

Rate levied on the commune for public works of the province.

Proportion of expenses of consular road, forming a main street of the commune; one-half is borne by the communes of more than 4,000 inhabitants; one-fourth by communes of population from 1,000 to 4,000 inhabitants.

Unforeseen expenses; as for the prevention of a threatened inundation, or any other sudden evil.

Amministrazione Communale.

In the month of September every fifth year the Decurionato, under the presidency of the Sindaco, forms the project of the Stato discusso, *i. e.*, of the yearly revenues of the commune for the next five years, and the uses of such revenues for that time. This is sent with the observations of the Sott' Intendente to the intendant by the end of September, who discusses it in the Consiglio di Intendenza, and forwards it to the Minister of Interior, who approves it himself for all communes with less than 5,000 ducats of *ordinary* revenue; and submits it to the approbation of the King for all communes whose revenues exceed that sum.

Every year, in the beginning of October, the Decurionato similarly forms the project of the "Stato di variazione," *i. e.*, the modificiation of "Stato discusso" for the coming year; this is subject in the same way to the approbation of the Minister of Interior or the King, according to respective incomes of communes. The "Stato" always includes a certain amount for "spese improovedute," one-half of which is at the disposal of the Sindaco, without reference to any one; for the other half he must apply to the Sott' Intendente.

All property belonging to the commune must be leased by auction; all the proceedings must be approved beforehand by the Consiglio d'Intendenza, and the result of the auction must be approved by the intendente.

Any other income derived from dazj di consumo or proventi giurisdizionali is either farmed or commuted for a rate.

No lawsuit can be undertaken by the commune without the approbation of the Consiglio d'Intendenza and the intendente; when the commune is the defendant, it cannot appoint its advocate without the approbation of the intendente. The commune cannot make any

contract without the express permission of the King, given on a statement of the case by the *Minister of the Interior.*

The intendente may force the commune to undertake a lawsuit, even against its will.

No length of time establishes any prescriptive right against the *public* property of the commune.

Public Works. When a road or any other public work is to be made in the commune, the Decurionato may propose the commencement of it. Their proposal is to be sent to the intendant, who submits it (with his approbation) to the Minister of Interior, who lays it before the King. After approbation by the King a commission is given to one or two engineers of the Direzione dei Ponti e Strado to examine and report on the expenses and method of performing the work. They submit their project to the Consiglio d'Intendenza, and thence to the intendente, who sends the papers with observations to the Minister of the Interior, who lays them before the King. Simultaneously they submit their bill of expenses to the Minister, who sends it to the intendente, and on his approval they receive an order from the commune for the amount.

There is then an auction for the performance of the contract, under the superintendence of the Consiglio d'Intendenza, after which the Minister of the Interior appoints the engineer who surveyed, in the first instance, as superintendent of the work. When a portion of the contract has been performed, the contractor applies for an advance of payment; the engineer is sent down, reports what is due to him, and on the approval of the intendente the commune is bound to make good the sum, in addition to the expenses of the visiting engineer; extreme vexation, delay and expense are unavoidably caused by this system.

Primary Education. Practically, the system of primary education is nothing; in a town of 8,000 inhabitants, perhaps from 20 to 30 boys attend. The master is generally a priest, and totally indifferent to the instruction.

CORRESPONDENCE between Earl *Grey* and the Right Honourable *R. More O'Ferrall* in the Year 1850, on the PROCEEDINGS of the COUNCIL.

(No. 9.)

Governor the Right Hon. R. More O'Ferrall to the Right Hon. Earl Grey. 11 January 1850.

COPY of a DESPATCH from Governor the Right Honourable *R. More O'Ferrall* to the Right Honourable Earl *Grey*.

My Lord, Malta, 11 January 1850.

I HAVE the honour to inform your Lordship that the first Session of the Council of Government opened on the 8th instant. The Members took the oath of allegiance at the Table.

I enclose copy of my Address, and of the amended Standing Orders, which I presented to the Council in conformity with the instructions.

On the motion of Dr. Dingli, the Council deferred the consideration of the Standing Orders to the 15th instant, and the Council is consequently adjourned to that day.

I have, &c.
(signed) *R. More O'Ferrall.*

(Enclosures.)

ADDRESS delivered by his Excellency the Governor to the Council of Government of *Malta* on the 8th January 1850, on opening the Session of 1850.

Gentlemen,

1. HER Majesty's Letters Patent and the instructions which accompanied them have fully informed you of the powers conferred by Her Majesty on this Council.

2. In conformity with the third section of those instructions, I have directed standing rules and orders to be prepared and laid before you for the regulation of your proceedings.

3. I am

3. I am happy to be able to congratulate you on the continued prosperity of the revenue. A considerable surplus will remain after defraying the services of the year 1849.

4. I have to request your early attention to the consideration of the Criminal Code, and to the amendment of the Police Code. The Code of Civil Procedure is completed and will be presented at an early period.

5. The Estimates for the year 1851 are in course of preparation. An estimate has been prepared, and will be laid before you, for the construction of an orphan asylum on the site of the male hospital. Estimates will be laid before you for the construction of an asylum for the aged and impotent poor of this Island; for the construction of a new lunatic asylum; as also an estimate of the cost of a survey of the Crown property. The whole of these services to be defrayed from the surplus revenue.

6. The removal of the prison from the centre of the city affords room for the construction of a new market, which is so much required. I shall request your early attention to this subject, in order that timely provision may be made for so large an undertaking.

7. The favourable prospects of revenue induce me to hope that other works of public utility may be undertaken in future years. I particularly recommend to your attention and inquiry the best means of augmenting the supply of water throughout the Island for agricultural purposes, by the construction of large reservoirs in the upper valleys to receive the winter floods, which will have the double advantage of increasing the fertility by irrigation, and prevent injury to property and to the harbour from the accumulation of mud carried down by the rains.

8. The state of the lyceum and university has occupied my attention, with the view of adopting an improved system to render them more worthy of the public confidence; and I am happy to be able to inform you that the measures already taken in the university have been effective.

9. Considerable attention has been bestowed on devising an improved system of primary instruction for the poor. Dr. Pullicino is about to return from England, when the result of his inquiries will be laid before you.

10. I trust that your labours may be conducive to the interests of the Island and fulfil the expectations of the benefits to be derived from this new institution. You may fully rely on my cordial aid and anxious desire to co-operate with you in adding to the prosperity of Malta.

R. More O'Ferrall.

ANSWER to the above ADDRESS voted and Presented to His Excellency the Governor by the Council of Government of *Malta* on the 17th January 1850.

IN meeting your Excellency for the first time, we desire to take the present opportunity of solemnly expressing our gratitude to Her Majesty for the recent concession of the new Council of Government. The powers which Her Majesty has been pleased to confer on the Council impose on us, collectively and individually, duties of which we are deeply sensible.

The standing orders, which have been adopted by the Council, will, we trust, sufficiently provide for the regularity of their proceedings.

We share in your Excellency's satisfaction at the continued prosperity of the revenue, and the existence of a surplus on the past year.

We shall devote our best consideration to the codes to which your Excellency has called our attention; and we trust that we may thus, at no distant period, be enabled to confer on Malta the long expected benefit of an improved and systematized body of laws.

We shall be ready to take into attentive consideration the various estimates which your Excellency proposes to lay before us, and the works of public utility for which they are intended to provide.

We trust that the continued prosperity of the revenue may permit us further to co-operate with your Excellency in the advancement of similar undertakings; and with this view we will not fail to direct our attention to the highly important subjects indicated by your Excellency for our future consideration.

We receive with great satisfaction your Excellency's statement of the present and anticipated improvements in public education, which we shall always be ready to forward to the utmost of our power.

We enter on our task with implicit reliance on your Excellency's cordial and anxious desire to co-operate with us in promoting the prosperity of Malta. No efforts shall be wanting on our part to fulfil the hopes on which the new Council is founded, and to justify your Excellency's trust in the advantages to be derived from our united labours.

Voted and presented 17th January 1850.

Wm. Sim, Clerk of the Council.

(DRAFT.)

STANDING RULES for the Maintenance of Order and Method in the Despatch of Business in the Council of Government of *Malta*.

COURSE OF PROCEEDING.

WHEN, in pursuance of the Royal instructions, the head of the Civil Government (or in his absence the presiding member) shall have taken the chair and the minutes of the preceding meeting shall have been read and confirmed, members may present petitions, of which the heads may be stated, but no discussion shall then take place on the matter of such petitions; they may, however, be read with special leave of the council. The Chief Secretary to Government shall then move that the order of the day be read. Questions relative to public business may then be put.

Such questions shall be put to the official member whom they may concern, and in case they should refer to departments, the heads of which should not be members of the council, they shall be put to the Chief Secretary to Government; but no official member shall be required to answer any such question, unless he shall have received two days' notice in writing of the intention to put it. When the questions shall have been disposed of the council shall proceed with the order of the day according to the order book.

The clerk of the council shall keep three books—an order book, a notice book, and a minute book. In the order book shall be inserted the business appointed to be proceeded with each day, such as the ordinances to be discussed, or motions already before the council. The notice book is to contain transcripts of all notices given by members who may desire to bring any subject before the council for discussion. Each such notice must be delivered to the clerk in writing, with the signature of the member bringing it forward, three clear days before the day named or proposed for said discussion. Such notices to be of the nature following:—

Notice for leave to introduce an ordinance, such notice to specify the subject.

Notice to call attention to the statements of any petition which has been received by the council, or to any particular cause of public complaint connected with any of the departments of Government.

Notice of any amendment to be moved in committee on any ordinance.

And notice of any other motion which the council is competent to entertain.

The minute book to contain minutes of the proceedings, kept in accordance with Her Majesty's instructions.

All orders of the day have precedence of notices. If not disposed of they are placed at the head of the list of orders for the following day. If the notice of motion is not proceeded with on the day appointed, it may be postponed to another day.

Questions of order may, by leave of council, on the motion of any member, take precedence of all other business.

Questions of privilege, *i.e.*, questions touching the rights of the council or of any member of the council as such, may in like manner take precedence of all other business, except questions of order.

Before the close of each sitting of the council, the Chief Secretary to Government, or in his absence the next official member, shall propose in the words following, "That this council shall at its rising adjourn to. . . . . ."

As soon as possible after each sitting, a copy of the order of the day for the subsequent sitting shall be forwarded to each member.

RULES OF ORDER.

Any person interrupting a member while speaking shall be called to order and obliged to sit down. Any member not speaking to the question under discussion shall be called to order. No member shall refer to the discussions on a former debate. No personal or offensive allusion shall be made to any member. No bad motive shall be attributed to any member. No member shall be addressed personally by any other member in debate. The member who presents a petition shall write his name on the back thereof, and is responsible for its being properly and respectfully worded.

A motion which shall not be seconded shall be considered as dropt. No member shall read a speech. No member shall speak twice in the same discussion, except the mover in reply, or except in general committee. No member shall speak after the reply of the mover of a motion, nor after the question has been put. A member may explain, with permission of the president and council, if he has been misrepresented. At the close of a debate the question shall be put by the president, unless the mover of the question shall withdraw his motion with permission of the council. If an amendment has been proposed, the amended motion shall be put first; if several amendments shall have been proposed the president of council or chairman of committee shall decide on the order in which they are to be discussed.

Every member who is present at a division shall vote. Votes shall be taken openly, and entered on the minutes of the day.

Committees.

For the purpose of examining the details of any measure, the council shall resolve itself into a general committee. For separately investigating any subject, it may appoint a special or select committee.

In general committees the presiding member of council may preside or name a chairman.

Select committees may name their own chairman.

The council may give any select committee power to send for persons and papers, and to examine witnesses. In cases of refusal of witnesses to attend, &c. the chairman of the select committee shall apply to the presiding member of council, who shall enforce attendance as before the council.

Committees shall report to the council, and shall add, if they think fit, or if required by the council, the depositions of any witnessess, documents, &c.

Any witnesses whom the council or any committee shall think fit to examine, shall receive notice thereof by summons from the clerk of the council.

Any member, not belonging to a select committee, shall be permitted to attend its sittings; but he shall not be allowed to interfere in its proceedings.

Laws or Ordinances.

On moving, after notice duly given, for leave to introduce a project of law or ordinance, the member shall state the object and purport of the law, and the question shall be put to the council whether leave be given or not, on which the council may divide. If leave be granted, the ordinance shall be laid on the table in manuscript in the English and Italian languages, and the motion shall be put that the ordinance be read a first time and printed, on which the council may divide. If carried in the affirmative, the clerk of the council shall cause each member to be furnished with a printed copy of the ordinance in Italian and English, and shall cause it to be published in the "Government Gazette" in accordance with Her Majesty's instructions. The mover, with the consent of the council, shall name a day for the discussion of the principle of the ordinance. The discussion shall take place on the question, "That this ordinance be read a second time." If the motion be carried in the affirmative, a day shall be named for discussing the details of the measure in committee of the council.

The chairman of such committee shall take his seat at the table and propose that the preamble be postponed, in order that it may be amended in conformity with the alterations that may be introduced in committee. The clerk at the table shall then read the first section, and if any member shall have given notice of any amendment of such section, such member shall then propose it to the committee, who may discuss the same, and decide by vote for or against the amendment; and, if the amendment is lost, then for or against the section in the original form, and so with all other sections of the ordinance; and, finally, the committee shall decide on the preamble, altered, if necessary, in conformity with the alterations that have been made in the various sections. The chairman shall then report to the council the result of the discussion in committee.

It shall be competent for the council to recommit any ordinance before the period fixed for the third reading, on the motion of any member, for the purpose of introducing further amendments, but not for the purpose of founding a new discussion on any matter already rejected.

After the new motions that may have been made in amendment shall be determined, the discussion of the amended project, as a whole, shall be taken on the question, "That the present project do pass into an ordinance."

Annual Estimates.

The estimates shall be laid on the table of the council, and be printed for the information of members. The Chief Secretary to government shall give days' notice in the council of the day or days to be named for discussion of estimates, stating for each day, as nearly as may be, the particular estimate to be brought forward. He shall make a general statement of the ways and means of providing for the estimates proposed. On the day named, the head of each department, being a member of the council, shall propose the estimates of his office. Other estimates to be proposed by the Chief Secretary, or other official member. Supplementary estimates may be brought forward on the same length of notice with other motions.

Strangers.

No strangers are admissible as of right.

It shall be competent to each member of the council to obtain for each sitting two tickets of admission from the clerk of council, on each of which he may insert the name of one person, writing his own name on the back; such ticket to be available for the sitting of the day of which it shall bear date, and no person to be admitted who does not deliver to the doorkeeper his ticket of admission. Strangers who disturb the proceedings by talking, or other impropriety, shall be removed by the messenger, and shall not be re-admitted during the Session without leave of the council.

On a motion from any member, even without expressing any cause, that strangers do withdraw, they shall withdraw and remain excluded until the council shall direct their re-admission.

In select committees no strangers shall be present.

(No. 17.)

Governor the Right Hon. R. More O'Ferrall to the Right Hon. Earl Grey. 23 Jan. 1850.

COPY of a DESPATCH from Governor the Right Honourable *R. More O'Ferrall* to the Right Honorable Earl *Grey*.

My Lord, Malta, 23 January 1850.

I HAVE to inform your Lordship that the Council of Government has met several times. They have agreed to the standing orders, with slight alterations. On this day the Criminal Code was presented, read a first time, and ordered to be printed. The second reading is appointed for Saturday the 26th instant.

2. The Police Code and the Code of Civil Procedure were also introduced, read a first time, and ordered to be printed. Also an ordinance to authorise the transfer of goods in bond.

I have, &c.
(signed) *R. More O'Ferrall.*

CORRESPONDENCE in the Year 1860 between the Duke of *Newcastle* and Sir *J. G. Le Marchant*, relative to the COMBINATION of the CIVIL and MILITARY ADMINISTRATION.

H. Merivale, C.B., to the Under Secretary of State for War. 6 Aug. 1859.

COPY of a LETTER from *H. Merivale*, C. B., to the Under Secretary of State for War.

Sir, Downing Street, 6 August 1859.

I AM directed by the Duke of Newcastle to request that you will state to Mr. Secretary Herbert that much inconvenience at present exists in Malta from the conflicting powers of the Governor and the Commander of the Forces, and that questions in time of peace are constantly arising in which the public interests would be materially consulted by the union of the civil and military authority in one person. In the event of war, on the other hand, the power of the Governor would be superseded by that of the Commander of the Forces, with a consequent loss to the public service of the knowledge possessed by the former of much important matter of detail.

Under these circumstances, his Grace would suggest that the two appointments should be centred in the same person at as early an opportunity as possible.

(signed) *Herman Merivale.*

Note.—In consequence of this representation, Her Majesty's Government decided that the command of the troops at Malta should be united with the office of Governor in the person of Sir Gaspard Le Marchant.

M A L T A.

COPIES of DESPATCHES of Earl *Grey*, addressed to the Right Hon. Mr. *More O'Ferrall*, in the Years 1847, 1848, and 1849, relative to the establishment of a COUNCIL of GOVERNMENT and LEGISLATIVE CHAMBER in the Island of *Malta*; of REPORTS addressed to the Secretary of State for the Colonies by the late Mr. *H. Lushington*, in the Years 1847 and 1848, on the establishment of MUNICIPAL INSTITUTIONS in the same Island; &c.

(*Mr. Torrens.*)

Ordered, by The House of Commons, *to be Printed,*
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REPORT

ON THE

SANITARY CONDITION OF MALTA AND GOZO

WITH REFERENCE TO

THE EPIDEMIC CHOLERA

In the Year 1865.

BY DR. SUTHERLAND.

Presented to both Houses of Parliament by Command of Her Majesty.

108657

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REPORT

ON

THE SANITARY CONDITION

OF

MALTA AND GOZO,

WITH REFERENCE TO THE EPIDEMIC CHOLERA

Of 1865.

TO THE RIGHT HONOURABLE THE SECRETARY OF STATE FOR WAR.

In compliance with instructions directing me to proceed to Malta to examine into the local conditions under which cholera had manifested itself during the late epidemic there, with the view of ascertaining whether additional experience obtained from it, in any way modified those conclusions regarding improvement of the garrison at which Captain Galton and I had arrived in our "Report on the Sanitary Condition of the "Mediterranean Stations," I have the honour to state that before proceeding to Malta I prepared and sent out statistical forms for registering the leading sanitary facts relating to dwelling houses and barrack accommodation where the epidemic had shown itself, and that in March last, at as early a period as I could leave England after the removal of quarantine restrictions, I proceeded to Malta and communicated with his Excellency the Right Hon. Sir Henry K. Storks, the Governor, by whose kind assistance I was enabled to obtain through the different departments whatever information I required.

I inspected districts, and many houses and rooms, where cholera had prevailed, within the garrison and in villages of Malta and Gozo, together with the quarantine establishment and public charities, in company with Mr. Inglott, Comptroller of Charitable Institutions. I also had an opportunity afforded me of inspecting barracks and hospitals, through the kindness of General Ridley and Inspector-General Dr. Anderson, Principal Medical Officer. Having now completed the inquiry entrusted to me, I beg to report the results under the following heads.

I shall first give the mortality statistics of cholera derived from an interesting set of tables prepared by Dr. Ghio, Chief Police Physician.

I shall next give some account of the Maltese epidemic in relation to cholera in Arabia and Egypt. After this will follow an account of the public health before cholera appeared, as well as of the earlier cases of cholera in the islands, to show the order in which different districts and houses were attacked, and under this head an opportunity will be afforded of discussing the statistical distribution of the epidemic.

The sanitary statistical facts entered by Dr. Ghio in the forms sent out to Malta, already referred to, will next be considered, and will show the relation which sanitary condition bore to the intensity of the epidemic.

I shall then give the experience of the disease in public institutions.

I propose next to give some account of the present sanitary law and practice in the islands, and at the same time to point out the class of improvements required for protecting the public health in time to come.

Next in order will follow an account of cholera as it occurred among soldiers and their families, together with an estimate of the state of barrack accommodation and its influence on the disease, as this is shown in the sanitary statistical forms filled up by medical officers of regiments.

And I shall conclude the report with a statement of the results of an inquiry re[redacted] cases of communication of cholera by personal intercourse, and into the op[redacted]

quarantine restrictions against cholera on the public health and commercial interests of the islands.

I.—Statistics of Cholera.

a. Population of the Islands.

According to the census of 1861, the civil population of the island of Malta amounted in that year to 118,596.

At the same date the civil population of the island of Gozo was 15,459.

There is a small annual increase of the population of about 1,000 for Malta, and 80 for Gozo, but it will be sufficient for the purposes of comparison, if we assume the census numbers as representing approximately the population of both islands when cholera appeared in 1865.

The death rates from all causes among this population for three successive years, including the cholera year 1865, are given in appendix No. I.*

They were as follow:—

Years.	Deaths per 1,000.	
	Malta.	Gozo.
1864	27	23
1865	47	46
1866	25	23

The average military population in 1865 (Table II.) was as follows:—

Men	6,105
Women	526
Children	838

b. Mortality from Cholera.

The first case of cholera during the epidemic of 1865 appeared in a soldier's child on June 20th. The last case of the epidemic in a soldier took place on November 12th. The disease began earlier and lasted longer among troops than among any other class of the community.

Nine days after the disease appeared among the troops, *i.e.*, on June 29th, the earliest case occurred among the civil population of Malta. Three weeks later on July 21st, the first case took place in Gozo, but the patient was ill when he landed in the island, and the first indigenous cases showed themselves in Gozo on July 24th.

Three months later, on October 24th, the last cases took place in Gozo. Sixteen days afterwards, on November 9th, the last case occurred among the civil population of Malta; and as already stated on November 12th, a soldier in Malta was attacked, and the epidemic came to an end.

Table III. abstracted from tables prepared by Dr. Ghio, gives the total daily cases and deaths from Cholera among all classes of the civil and military population. The following is a summary of this table:—

		Cases.	Deaths.
Civil Population.	Malta	2,362†	1,479
	Gozo	545	252
	Soldiers and their families	199‡	142
		3,106	1,873

* A few years ago a Registration Ordinance was enacted in Malta, and a registrar was appointed, but, singularly enough, the registration office takes no cognizance of causes of deaths. These are registered separately by the police. It will be observed also that Form No. 1 is signed, not by the registrar, but by the superintendent of police. These anomalies should be removed. It will be seen further on, that an improved diagnosis and nomenclature of diseases is urgently required. It would be a great advantage to conform entirely in these matters to home practice by using the same nomenclature, and by requiring the registrar to enter in his books not only the *fact*, but the *cause* of death.

† Including two fatal cases which took place on board ship in the harbour.

‡ Dr. Ghio gives the total cases of cholera among the military population at 202, and the deaths at 145, [illegible]ed Dr. Anderson's statement in the text. The small difference in numbers is probably due to the [illegible]few cases of fatal choleraic disease may have been classed as cholera.

There were three fatal cases on board Her Majesty's ships in harbour; besides a fatal case in a seaman under treatment in hospital for consumption.

Table IV. gives the sexes and ages of all who died of cholera in each of the cities and villages of Malta and Gozo. It shows that for every 100 males who died of this disease, there died 132 females, and that the epidemic fell very heavily on the advanced periods of life.

Table II., kindly prepared by Dr. Anderson, gives the following details regarding cholera among the military population:—

	Cases.	Deaths.
Men - - - -	126	90
Women - - - -	48	34
Children - - - -	25	18
Total -	199	142

Besides cases and deaths from cholera among the civil and military population, there were fatal attacks among persons in quarantine.

Table V. shows that during 48 days intervening between June 14th and July 31st, the following numbers arriving from Alexandria were landed at the Lazaretto, and placed in quarantine:—

Passengers - - - - - - - -	2,031
Persons who had held communication with them -	138
Health Guards - - - - - - - -	134
	2,303

The daily population of the Lazaretto was in a constant state of fluctuation from varying arrivals and discharges. At first the daily numbers amounted to 83; they then gradually increased to 1,359, from which point the numbers diminished until cholera ceased.

The amount of choleraic disease in the Lazaretto between the dates specified, was as follows:—

Diarrhœa.		Cholera.	
Cases.	Deaths.	Cases.	Deaths.
17	—	23	14

It is necessary to bear in mind that passengers remained in the Lazaretto only during their days of quarantine, while coal labourers and health guards were more or less continually on duty there.

These quarantine cases and deaths, if added to the others, would make the total attacks from cholera in 1865 amount to 3,129, and the deaths to 1,887.

The following were the proportions of attacks and deaths among different classes of population:—

	Cholera per 1,000 of the Population.	
	Attacks.	Deaths.
Civil Population { Malta - - -	19·9	12·4
Civil Population { Gozo - - -	35·3	16·4
Soldiers - -	20·6	14·7
„ Wives -	91·	64·6
„ Children -	30·	21·4
Total Civil and Military Population -	22·	13·2

The death rates to cases treated as deduced from the returns were:—

Civil population of Malta - - -	62 per cent.
„ „ Gozo - - -	46 „
Soldiers and their families - - -	71 „

These great differences in death rates may be partly due to differences in the severity of cases in the three groups of population, but I am inclined to attribute much of the greater proportionate mortality among military attacks to more strict and accurate diagnosis of cases by the regimental surgeons. But whatever the explanation of the difference may be, the Malta epidemic of 1865, in so far as relates to its proportionate mortality, must be classed among the most mortal on record.

Table I. shows that the population decreased under the effects of the epidemic, to an extent of 1,366 in Malta, and 68 in Gozo.

c. Statistical distribution of Cholera.

The statistical distribution of cholera over the islands was as follows:—

With the exception of a few inhabitants living in scattered houses in the country, the population of Malta and Gozo is located in towns within the garrison or in country villages (casals). The towns resemble other Mediterranean cities, except that they are much better built than most of them. The town population has a considerable resemblance to other Levantine populations. This is not the case in the villages, which contain a different kind of population, having other habits and customs, and whose dwellings bear little resemblance to those in the towns.

An inspection of Map No. II. will show how the people are distributed, better than could be done by any mere description, and it also shows that wherever in the islands there were groups of population, cholera prevailed.

Tables VI., VII., VIII., and IX., contain weekly abstracts of statistical tables by Dr. Ghio, showing the daily cases and deaths in each group of population in Malta and Gozo. All the deaths in these tables have been transferred to the maps, and are marked by dots:—Those for the cities on Map No. III., and for the country population on Map No. II.

The following summaries of these tables give the cases and deaths for the civil population living in the garrison, and also for the towns and villages in the islands:—

Cities within the Garrison.	Population 1861.	Cholera 1865.		
		Cases.	Deaths.	Deaths per 1,000.
Valletta - - -	23,993	454	282	11
Floriana - - -	5,791	76	48	8
Senglea - - -	6,887	99	64	9
Burmola (Cospicua) -	10,933	175	122	11
Vittoriosa - - -	5,712	175	107	18
Total - - -	53,316	979	623	11·7

There were thus 623 deaths among the civil population of the garrison, giving a ratio of 11·7 per 1,000; but to this number must be added the mortality among soldiers and their families who were taken ill while living within the garrison, and also deaths taking place among aged and infirm persons in the Ospizio, at Floriana, and among patients in the central civil hospital, Floriana.

With these additions, the total deaths among the resident population were distributed as follows:—

	Deaths from Cholera.
Civil population - - - -	623
Soldiers and their families - -	121
In the Ospizio - - - - -	30
In the Central Hospital - - -	7
	781

And adding to these 14 deaths in quarantine,* we find the total mortality of the garrison towns to have been 795.

* quarantine establishment, although outside the walls of Valetta is close to Fort Manoel, and is occupied by troops.

The epidemic was distributed among the towns and villages of Malta, outside the garrison, in the following proportions:—

Towns and Villages in Malta.	Population 1861.	Cholera.			Towns and Villages in Malta.	Population 1861.	Cholera.		
		Cases.	Deaths.	Deaths per 1,000.			Cases.	Deaths.	Deaths per 1,000.
Attard -	1,239	19	11	8	Zeitun -	5,491	164	84	15
Misida -	1,858	55	39	20	Calcara -	436	8	5	11
Rabato and Notabile.	5,916	143	91	15	Gudia -	932	11	5	5
					Axiack -	1,200	37	24	20
Birchircara -	5,978	142	98	16	Balzan -	662	1	1	—
Corradino -	187	4	3	16	Lia -	1,371	12	8	5
Curmi -	6,001	159	92	15	Paola -	485	4	2	4
Musta -	3,828	22	14	3	Tarxien -	1,265	22	10	7
Naxaro -	2,768	33	19	6	Siggieui -	2,641	70	40	15
Micabiba -	894	34	19	21	Crendi -	949	2	2	2
Zebbug -	4,884	99	62	12	Luca -	1,592	20	16	10
Zabbar -	4,327	88	54	12	Melleha -	975	3	2	2
Via San Guiseppe.	1,578	40	26	16	St. Paul's Bay.	476	1	1	—
Sliema -	324	24	14	—	Safi -	286	8	4	14
Zurrico -	2,797	34	24	8	Chircop -	409	4	1	—
San Giuliano	476	7	7	15	Dingli -	594	1	1	—
Gargur -	1,200	9	6	5					

The total population of these villages in 1861, was 64,019; and there were 1,280 cases, and 785 deaths from cholera among their inhabitants.

The death rates from cholera varied considerably. Excluding the smaller numbers they may be taken at from 6 to 20 per 1,000.

An outbreak of cholera took place at Saura's Hospital, Rabato, in the latter part of August and early in September 1865, so fatal that out of 88 inmates, 32 were attacked, and 27 died. If these deaths be added to those of the villages, the total mortality in the country districts of the island of Malta will amount to 812, or a little less than 12·7 per 1,000 of the population. Hence the death rate from cholera in the open country districts of Malta exceeded the death rate in the crowded towns by 1 per 1,000. To the total deaths among the civil population of the country districts must be added, 21 deaths among soldiers and their families living at Pembroke Camp, St. Julians, and Notabile, which will raise the total cholera mortality of Malta, outside the garrison, to 833.

The next abstract shows the mortality from cholera in towns and villages of the island of Gozo:—

Towns and Villages of Gozo.	Population 1861.	Cholera.			Towns and Villages of Gozo.	Population 1861.	Cholera.		
		Cases.	Deaths.	Deaths per 1,000.			Cases.	Deaths.	Deaths per 1,000.
Xeuchia -	1,345	38	18	13	Munxar -	147	12	5	34
Rabato -	4,023	178	74	18	Santa Lucia -	232	4	1	—
Caccia -	1,996	79	30	15	Kercem -	793	19	9	11
Nadur -	2,546	13	6	2	Zebbug -	556	42	18	32
Sannat -	793	43	25	31	Ghain Siclem	916	1	—	—
Marsalforn -	25	3	2	—	Kala	500	2	1	—
Garbo -	1,295	68	33	25	Ghammar -	263	11	5	19

These villages in Gozo had an estimated aggregate population of 15,430, and they yielded 513 attacks, and 227 deaths from cholera.

But to these numbers must be added 26 attacks in old people in the Ospizio at Rabato, of which 21 proved fatal, and six cases attacked in the civil hospital there, of which four died. The total attacks were thus 545, and the deaths 252, giving a death rate of 16.4 per 1,000.

It follows from this statistical analysis of the mortality:—

1. That the epidemic cholera of 1865 was scattered over Malta and Gozo;
2. That it attacked both civil and military population;
3. That the death rate from it was highest among soldiers and their families;
4. That the native country population of Gozo suffered more severely t[illegible] similar population in Malta;

5. And, that contrary to what might have been expected, the people living in sparse country villages in both islands suffered more from cholera than the population of the crowded garrison towns.

I shall next proceed to give an account of the epidemic itself.

II.—History of the Epidemic Cholera of 1865.

(*a.*) *Appearance of the disease in Arabia and Egypt.*

An opinion firmly held by a majority of the population of Malta is, that the severe epidemic cholera of 1865 began at Mecca and Medina during the pilgrimage of that year; that the disease was carried to Djedda on the Red Sea, from thence to Suez, from Suez to Alexandria, and from Alexandria to Malta and to other ports of the the Mediterranean; and that this transference of disease was effected by ships, pilgrims, and natives of various Mediterranean countries who fled before the scourge, carrying the infection with them, to every port where they unhappily disembarked.

As a logical consequence of this opinion, the same persons hold, that by quarantine restrictions alone, carried out with a stringency never before considered to be either necessary or practicable, can future invasions of cholera be prevented.

As another logical consequence, influential individuals in the islands have avowed to me their belief that cholera connects itself with persons and not with localities; they hence consider that measures of hygiène are either altogether of subsidiary importance, or that they are useless in mitigating the severity of epidemics, and that if quarantine cannot keep out "contagion" there is no hope for the population in time to come.

The entire chain of reasoning is perfectly consistent; more so, indeed, than is usually the case in such discussions in other countries, and on account of its very consistency it is all the more necessary that the facts on which it rests should be firmly established before we adopt the momentous conclusions to which it inevitably leads.

Besides the popular opinion to which I have referred, there is a scientific doctrine held by some persons in Malta as elsewhere, derived chiefly from the expressed or published opinions of others, round which the phenomena of the late epidemic are, in perfect good faith, made to arrange themselves. Such, for instance, as the existence of a specific cholera virus, transferable from person to person by intercourse, by clothing or other media, or by excreta of cholera patients, soiled linen and the like, in such a way that persons who may not themselves suffer from cholera may transfer the disease to others who may die of it.

The first thing, therefore, with persons holding such views when successive cases of cholera present themselves, is to search out diligently every presumable channel of communication, and whenever they have found one sufficient to satisfy their own minds, they consider their work done. They either lose sight of, or they undervalue the importance of other facts, and their conclusion is, that practically the prevention of personal intercourse, directly or indirectly, when cholera prevails, is the only safe course to be followed. It is true that such conclusions are not always fully deduced from the doctrine, but they are, nevertheless, the real consequences which it tends to impress on the mind, so that while the practical result of the popular opinion of epidemics being carried from place to place on board ship, would be to put an end to commerce when epidemic diseases prevail, or are suspected to exist, this scientific doctrine held along with it, would logically put an end to social intercourse, and to humane care and treatment of the sick.

It is no part of my duty to enter into discussions of such subjects, but I have felt myself bound to state the impressions conveyed to me in Malta at the commencement of this inquiry, on account of the serious obstacles which those views present to the adoption of really efficient means of improvement; for if the authorities in Malta, to whom appertains the sanitary care of the population, should feel themselves called on to act strictly in accordance with opinions which I have heard expressed, there is, of course, an end of any reasonable hope of removing the real causes on which the high epidemic susceptibility of the population depends.

It is, besides, impossible to ignore altogether the alleged fact of importation, and for the obvious reason that if the cholera epidemic of 1865 were really carried on board ship to Malta, then restriction of intercourse becomes an important matter as regards the future safety of the population from invasion of epidemic diseases.

In dealing with this part of the subject it is necessary, in the first place, to ascertain the real facts of the case, but it unfortunately happens that on some very important [illegible] information is incomplete. We have no reliable account of the state of health in the Arabian peninsula, or of Egypt itself, before cholera appeared. We do not

know under what precise circumstances cholera broke out, whether it came suddenly, or whether it was preceded by any altered condition of the public health. We have no account of the first cases of the disease, or of how they originated.

There is, in fact, an almost total blank in our knowledge at the very point where exact information is of the greatest importance. This deficiency is nothing more than has always existed in our information about these Eastern epidemics, and there is no reason to hope for the advent of more enlightened views regarding them, until we are enabled to keep an account current, so to speak, of the condition of public health in those epidemic centres where pestilences make their first appearance.

Under present circumstances it is not surprising that hypothetical considérations should enter so largely into popular beliefs regarding the mode of propagation of epidemic diseases. But the time has certainly arrived for establishing more exact methods of inquiry, and for separating what is true from what is supposititious in their history.

The first intimation, for instance, of cholera in Arabia was contained in private letters and newspaper paragraphs, announcing an outbreak of pestilence among pilgrims at Mecca, which had destroyed 20,000 persons during the first three weeks in May 1865. The first official notice of cholera in Egypt received by the Government of Malta was contained in a telegram from the consul at Alexandria on June 14th. Admitting the facts to be correct, one cannot help regretting that they convey so little real information as to the history of the disease. There are, it is true, some other facts which I shall presently mention, bearing on the progress of the disease from Mecca to Alexandria in the line of pilgrim caravans; but when we are told from another source that "a letter "from Alexandria ascribes the cholera there to fatigue and sun exposure, and that the "malady has appeared up the country almost simultaneously at widely distant "points,"* we feel how much is yet to be learned before we arrive at reliable facts regarding the earlier history of the epidemic.

There appears to be little doubt that much of the prevailing uncertainty regarding disputed points in the history of all epidemic outbreaks is really the result of want of information; so that almost any form of hypothetical doctrine may find support in occurrences alleged in its behalf.

The danger in all such cases where the history is necessarily incomplete is mistaking coincidences for effects, a result which can only be avoided in future by adopting a more rational and systematic mode of enquiry.

Great epidemics have generally been preceded more or less by marked disturbances in the health of men and animals. Epidemic diseases of different kinds and epizootics have not unfrequently co-existed at such periods, and from the information I have been able to obtain, the epidemic years 1865–66 have been no exceptions to the rule.

It is unnecessary to do more than merely to allude to the existence of severe and fatal forms of fever and cattle plague which were so prevalent in various parts of Europe before cholera appeared, as indications of this disturbance.

In Arabia there is reason for believing that the usual premonitions were not absent: for in the month of March and April 1865, a fatal form of Typhus appears to have prevailed at Mecca, Medina, and Djedda, which carried off nearly 50 persons a day in each of the first two cities.†

About the same period an epizootic disease prevailed over nearly the whole of the eastern shores of the Mediterranean. Of this fact we have official evidence in the minutes of the Malta Board of Health of April 29th 1865, prohibiting the importation of cattle from Egypt, Syria, Smyrna, Spain, Dalmatia and Sicily.‡

At a later period, in the middle of June, at the date when quarantine was established at Malta, small pox is also stated to have existed at Suez, while cholera was committing ravages at Djedda.§

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* "Gibraltar Chronicle," 27th June 1865.

† "A letter from Djedda of the 3rd April says, that considerable havoc has lately been made by typhus in that city, but, fortunately, not to the same extent as at Mecca and Medina. At each of these last places nearly 50 persons die daily, and grave apprehensions are experienced lest the evil should spread still further when the crowds of pilgrims arrive."—(*Malta Times and United Service Gazette*, 27*th April*, 1865.)

‡ "Official reports having been laid before the Board of Health stating that the cattle disease still exists in Egypt, Syria, Smyrna, Spain, Dalmatia, and Sicily, the Board, having fully considered the said repor beg to recommend that the importation of cattle from these places be prohibited."—(*Minute of Malta B of Health*, 29*th April* 1865.)

§ "It is stated that cholera has broken out at Djedda among the pilgrims returning from Mecca small-pox is raging at Suez."—(*Malta Observer*, 15*th June* 1865.) The co-existence of sma cholera has also been observed in India (*vide* Report of General Board of Health on the cholera

It is to be regretted that our information about the state of health of the East at this time is not more complete. But in regard to Malta, we have information which throws much light on the entire history of the epidemic in the islands.

b. State of Public Health in Malta and Gozo before the Cholera of 1865.

In Table X. there is given a monthly abstract of climatic elements for Malta during the year 1865. In comparing these elements with similar ones for years during which there was no excess of epidemic diseases, given in the Report on the Sanitary Condition of the Mediterranean Stations, there is nothing very special to indicate that the climate of 1865 was unhealthy. If there was any peculiarity in the weather of this year, it was perhaps somewhat dryer than the average, and the temperatures were lower, a circumstance apparently due to the unusual prevalence of winds from northerly directions throughout the year. It will be seen that all the general directions of winds were from N.W. and N.E. The total rain collected during the first eight months of 1865 before the advent, and for two months of the prevalence of cholera was barely 7 inches. But in years when no epidemic diseases have prevailed the rainfall has both been greater and less than this amount. The most remarkable occurrence was the fall of above $7\frac{1}{3}$ inches of rain during September and October 1865, while cholera was declining; an amount more than seven-fold the average for the same months of 1859 and 1860.*

In describing the state of public health preceding cholera, I shall first give the results of an inquiry carried out by the police authorities at my request, showing the comparative numbers of cases of gastric affections brought under treatment by district physicians and in the public institutions of Malta and Gozo for the first six months of 1864, in comparison with the numbers for corresponding months of 1865, preceding the outbreak of cholera. It is necessary to point out, however, that these facts have been obtained from one class only of the population, and that they only give a general idea of the state of public health at these two periods.

Table XI. contains the total cases in each district return; the following is an abstract of these returns.

	1864.	1865.
Dyspepsia and gastricism	1,915	2,086
Colic	595	777
Diarrhœa	1,042	1,243
Dysentery	465	559
Sickness and vomiting	149	180
Enteritis or gastro-enteritis	1,308	1,418
All other diseases	18,383	20,547

Two conclusions follow from this class of facts, first, that there is at ordinary times a very considerable amount of gastric disease among the poor; and, secondly, that there was a marked increase of all classes of gastric affections as well as of other diseases during six months preceding the cholera of 1865.

When cholera had established itself as an epidemic, gastric affections, as usually happens, increased to such an extent that few people escaped their influence in some form or other.

The next class of facts bearing on the public health before cholera appeared are contained in the mortality returns, and are hence of a more specific character.

During the earlier months of 1865, two diseases, fever and gastro-enteritis, which always exist in Malta, prevailed to an unusual extent, and occasioned an unusually large mortality in the island.

Abstract No. 90 of the census taken in October 1861 (Table XII. in the Appendix) affords the means of comparing the death rates from these diseases for the years 1859–60–61 with the mortality from them during the first six months of 1865 preceding the outbreak of cholera which is shown in the same table abstracted from tables by Dr. Ghio. In 1861

* The appearance of the sky is too much a matter of personal estimate to be admitted as evidence in such inquiries. It is, nevertheless curious that in a letter published in the "Malta Observer," on June 22, 1865, attention is called to the existence of "dense, many coloured, deeply mottled, and murkily marbled clouds, floating about in every and in opposite directions, some days obscuring the sun, giving a sombre and unnatural appearance both to sea, sky, and land, affecting more or less the nervous system with langour, depression, and lassitude, partial rains and almost invisible mists, seem to indicate a most unnatural and unhealthy state of things, and to point out that something evil is looming in the distance."
This was written just at the time cholera burst out in the plague hospital. The letter was objected to on account of exciting alarm, but I was assured that the facts were as stated.

the population of the islands amounted to 134,055, and the average annual deaths from fevers (nervous fever, petechial fever), during the three years mentioned above, amounted to 123. During the first six months of 1865, preceding the cholera of that year, with a probable increase of population up to 136,000, the deaths from various classes of fevers were 115; but we must double this number in order to obtain an annual comparison, and in doing so we find that while the annual death rate from fevers for the three years 1859–60–61, was 9 per 10,000 of the population, the mortality from fevers during the first six months of 1865 was equivalent to an annual death rate of 17 per 10,000. In order to comprehend the full value of this great increase it must, however, be borne in mind that the fever months in Malta are July, August, and September. These months are included in the annual average for the three earlier years, but they are necessarily excluded from the first half of 1865.*

Table XIII. in the appendix gives the localities from which cases of this fever were received into the Central Civil Hospital at Floriana together with the dates of the first and last cases received. This table contains of course only a certain proportion of fever cases, but the important fact which we learn from it is that fever prevailed in a number of places where cholera afterwards prevailed.

The disease was of so serious a character as to induce the Government to direct an enquiry to be made by a special board on April 22nd 1865. On this board were Drs. Engerer, Ghio, Pisani, Inspector General, Dr. Hume and Staff Surgeon Major the late Dr. Mathew. The enquiry was held at Zeitun. The reporters state that fever began to be unusually prevalent in the preceding month of January, during which 23 cases occurred; that in February there were 32 cases; in March 47 cases; and that in April there had been 47 cases. There had been, besides, 23 cases sent to the Central Hospital at Floriana. Fever at the date of the enquiry had declined. The mortality had been 11·4 per cent. of cases treated. After a careful examination of the facts the board arrived at conclusion that the fever was true typhus, apparently "due in "every instance to exceptional and preventible causes." The main cause assigned by the board was want of ventilation in houses, arising partly from their construction, partly from the pernicious habit of a whole family or most of them sleeping in one room, and partly from unusually cold weather having led the people to close all the apertures by which fresh air might have been admitted, "the sleepers being in fact poisoned by the "pent-up emanations from one another's bodies." There was no appearance of the disease spreading by infection either in hospital wards or villages, and the physician who saw most of the cases considered the disease purely of local origin.

The reporters indicate other local causes such as filthy habits and the like, as having exercised some influence over the severity of the disease. A note appended to table XIII., gives some insight into this matter. It is there stated in reference to the condition of patients received into the Central Hospital at Floriana that "the disgusting state of "personal filth in which each patient was received appeared to be the cause of the "disease."

The local causes specially connected with the houses will be noticed further on. Suffice it to say that the local causes which predisposed people to fever were the same causes which predisposed them afterwards to cholera. Another note on Table XIII., informs us that "in proportion as cholera invaded the island fever diminished, but "straggling cases continued to arrive, as usual during the heat of summer." When cholera came epidemic fever was replaced by epidemic cholera. The local causes remained the same, the disease only was changed.

The disease known in Malta by the names "*gastritis*," "*enteritis*," or more usually "*gastro-enteritis*," appears to be made up of different diseases classified under the same general designation from want of a good nosological arrangement such as is now very generally adopted. The symptoms vary in character, and different medical practitioners in describing the disease give more prominence to certain phenomena than to others. Sometimes the disease is attended by acute symptoms, at others the symptoms are more chronic, but the character of the disease is diarrhœal, or rather it is choleraic, and it is most prevalent and fatal at and under 15 years of age. The following account of the symptoms abstracted from the statistical returns of district physicians will afford an idea of the usual cases.

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* Mortality in Malta and Gozo :—
Total Mortality, all causes, in 1859–60–61[a] = 9,907 ÷ 6 = 1,651 for 6 months. All causes, 6 mo[illegible] January 1st to June 30th, 1865[b] = 2,097.
Mortality from fevers in 1859–60–61 = 371 ÷ 6 = 62 for 6 months. Fevers, 6 months, Ja[illegible] to June 30th, 1865 = 115.

[a] Census of Malta and Gozo, 1861, Abstract No. 90 (vide Table XII., Appendix).
[b] Dr. Ghio's data in Table XII., Appendix.

Uneasiness and sense of oppression in the epigastrium; sometimes tenderness on pressure; coated tongue; thirst; retching; rumbling in the bowels; feverishness; pulse at times frequent and small; giddiness; vomiting of a yellowish or greenish mucous matter; sometimes constipation at commencement. Dark fluid stools; griping; cold skin; followed by frequent watery stools; watery bilious vomiting; sometimes cramps; sometimes diminished or suppressed urine; cold sweat; reaction; fever; death often from exhaustion, disease passing at times into gastric fever. The symptoms are modified in children by age and dentition.

The *post-mortem* appearances show softening of the mucous membrane with superficial ulceration and other morbid appearances.

The usual mortality from "gastro-enteritis" is very considerable in the islands. During the years 1859–60–61, the annual deaths ascribed to it averaged 405, or at the rate of 30 per 10,000 of the population: but in the six months of 1865 (January to June inclusive) preceding the cholera the deaths were 406 or in the annual ratio of 60 per 10,000. The annual death rate from this diarrhœal disease was thus doubled during the six months which preceded the advent of cholera.*

When cholera appeared, gastro-enteritis merged into cholera.

These facts are sufficient to show that long before cholera began its course towards the north-west there were indications of a changed condition of the public health in Malta. There was an unusual prevalence of fatal diseases of the zymotic class during the first six months of 1865. Two of these, fever and gastro-enteritis had indeed occasioned a loss of life nearly equal to one third of the total loss subsequently incurred from cholera itself, before a single death from cholera had taken place.

As the epidemic period approached, signs of the coming pestilence were yet more unequivocal. At the middle of May, while cholera still confined its ravages to the Arabian Peninsula, and before there was any known case of it in Egypt, two occurrences took place in Malta, which I shall notice next in the order of events.

About two miles west of Valetta, is situated the populous village of Birchircara, where, on May 17th, a sudden outburst of a very suspicious disease took place, the symptoms of which were so severe that the first cases were reported to the Government as true cholera. This led to an inquiry which showed that the report as to the disease having been cholera was incorrect, but the fact itself is of importance as proving the then precarious state of the public health, and the character which the disease assumed in the estimation of medical practitioners who first saw it. In a report (Appendix XIV.) prepared in April of the present year at my request, by Dr. Grillet, the disease is described as diarrhœa with heat in the bowels. But Dr. Ghio who went to the village at the time, informed me that the account he obtained of the disease from competent persons showed that the patients suffered from diarrhœa, vomiting, cramp, slight prostration, cold skin, pain in the bowels, followed by reaction on the skin. There were no deaths. The number of cases is not known, but they were scattered over the village, and continued to occur until cholera appeared in Birchircara on July 18th, and took the place of the other disease.

Another similar outbreak of a violent character occurred on May 20th, three days after the first case at Birchircara, in soldiers' families, at that time quartered in the main buildings of the Lazzaretto.

On the day referred to ten persons (eight men, one woman, and one child) living in some small, close, ill-ventilated rooms in part of the Lazzaretto buildings, close to offensive drains and a privy, were attacked with sickness and vomiting, diarrhœa, cramps, and coldness of skin,—the same symptoms as occurred in the Birchircara cases. In this instance, also, there were no deaths. It is important to remark that when the rooms occupied by these families were shown to me, it was stated that two fatal cases of cholera had taken place in two of the same rooms at a subsequent period, when they were occupied by persons in quarantine.

An interesting report supplied by the Hon. Mr. Inglott, regarding the charitable institutions, shows that as cholera approached the islands it was preceded by the usual foreshadowings in these establishments, Mr. Inglott states that, "Premonitory symptoms, "looseness of the bowels among the aged inmates of the 'Ospizio' not subject to chronic "diarrhœa, commenced to prevail more frequently than it was usual during the hot

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* [illegible] XII., Mortality in Malta and Gozo:—
[illegible]tritis-enteritis, 1859, 1860, and 1861[a] = 1,214 ÷ 6 = 202 for 6 months. Enteritis, January 1st [illegible] June 30, 1865[b] = 406.

[a] Census of Malta and Gozo, 1861, Abstract 90 (Table XII., Appendix).
[b] Dr. Ghio's data in Table XII., Appendix.

" season, about the middle of June, in Malta, and of July in Gozo." This was followed by fatal attacks of diarrhœa, and these by cholera.

On considering these facts it appears to me to be scarcely possible to escape from the conclusion that long before cholera appeared in Malta, possibly before its first outbreak in Arabia, the earliest wave of the coming epidemic had passed over the islands. This inference is further supported by the very remarkable facts about to be noticed connected with the first outbreak of cholera itself in Malta, in the plague hospital lying to the west of the Lazzaretto towards Birchircara, an outbreak greatly resembling in its appearance these diarrhœal seizures, except that it was true Asiatic cholera of a very fatal type.

c. *Progress of Cholera from Arabia to Malta.*

I shall now give a sketch of the progress of cholera from the time of its appearance at Mecca until it broke out in Malta. All the facts I shall use are taken from official documents; and however deficient they may be as regards details of the disease, I see no reason to doubt their accuracy so far as they go.

The facts are accompanied by dates. Upon the facts are grounded the popular opinion I have referred to respecting the importation of cholera from Egypt. We shall presently see how far this conclusion from the facts is, or is not, sustained by the dates at which the events took place.

We have already seen that in the month of April 1865, "Typhus" fever was stated to be the cause of 40 to 50 deaths a day at Mecca, and of an equal number of deaths at Medina, and that fears were entertained that when the pilgrims arrived great mortality would ensue.

The numbers who did arrive are variously estimated at from 150,000 to between four and five-fold this amount. All the accounts agree in stating that no sanitary arrangements were made for so vast an influx of people, and that the whole area occupied by the pilgrims was more or less polluted by filth, and by offal of slaughtered animals left to fester under the hot Arabian sun. Early in May 1865, cholera broke out with great violence at Mecca, and many thousands of pilgrims perished.* The bodies of the dead were left in mosques and other buildings or they lay unburied by the way-side. The pestilence attained its maximum severity about the middle of the month, and the pilgrims began to return homewards.†

At this date our information becomes more precise, for we have a report from Dr. Aubert-Roche addressed to M. Ferdinand de Lesseps, in which an account is given of the subsequent course of the disease in its relation to the interests of the Suez canal. An extract from this report is given in Appendix No. XV., and the following facts up to June 12th are taken from it.

On May 19th, an English steamer with 1,500 pilgrims on board, arrived at Suez from Djedda, after having lost a number of passengers on the voyage.

Two days afterwards, on May 21st, the master of the vessel and his wife were seized with cholera at Suez.

Next day, the 22nd, a single case of cholera took place in a convoy of pilgrims at Damanhour, near Alexandria.

There was no other attack until 11 days afterwards, on June 2nd when a single case took place in Alexandria, among some natives living with the pilgrims.

On June 5th two other cases occurred under similar circumstances, and it was not until the 12th June that the disease extended beyond the mixed group of population first attacked.

After June 12th cholera was considered to have established itself in Alexandria.

On June 14th the consular agents considered it necessary to telegraph the existence of cholera in Alexandria to their respective Governments, and accordingly, on this date the Government of Malta was informed of the fact by telegram.

On the same day, June 14th, a quarantine of seven days was declared at Malta against all vessels arriving from Alexandria.

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* In the progress of cholera towards Europe in 1847, it reached Mecca in January, "where it proved so "destructive to the Moslem pilgrims that from two to three thousand of them are reported to have perished "by it 'in the one night' of their pilgrimage from Mecca to Mount Arafat."—(Report of General Board of Health on Epidemic Cholera of 1848-9.)

† This Mecca epidemic bears a striking resemblance to similar epidemics which burst out during pilgrimages in India, where many thousands of persons with animals are crowded together without sanitary precaution. The exciting cause appears to be mainly impure air, and probably impure water, the impurities being de[rived] from the whole surrounding district being covered with excreta and other filth. The Madras S[anitary] Commission has, however, proved that these outbreaks can be prevented simply by cleanliness en[forced] police arrangements, and by providing latrines for the people. By these means annual cholera e[pidemics] immemorial recurrence have ceased in recent years.

These precise dates show the course which the epidemic followed in its progress towards the north-west, along one line at least.

I shall next state what took place with arrivals at Malta, and in doing so I shall make use of facts and dates supplied by the police authorities in a printed paper (Memorandum on the Cholera of 1865) an extract from which is given in Appendix XVI.

The first vessel with pilgrims, the "Ephesus," arrived at Malta from Alexandria on May 31st, after a voyage of five days. She had 235 pilgrims on board. The master reported that three pilgrims had died during the passage, but the deaths were caused neither by diarrhœa nor by cholera, but by "mortification," "constipation," and "senile exhaustion." Sixty-one pilgrims were landed at Malta; the remainder proceeded to Tunis next day.

By comparing the dates with those given in Dr. Roche's report, we find that the "Ephesus" left Alexandria on May 26th, or seven days before the first case of cholera in Alexandria. Independently of this fact, no connexion is alleged to have existed between the arrival of this vessel and the subsequent epidemic outbreak in Malta.

Between May 31st and June 9th, seven steamers with 237 passengers, chiefly pilgrims, on board, entered the harbour, apparently in good health; nothing to the contrary is stated.

On June 10th, the British steamer "Olympus" arrived in four days from Alexandria. "One of the crew affected with bowel complaint."*

On June 12th, three Peninsular and Oriental Company's steamers arrived with 268 passengers for England and 28 for Malta, all well apparently.

On the 13th June, the British steamer "Alexandra" arrived in five days from Alexandria, with six passengers for Malta and three passengers for Liverpool. No sickness stated to have been on board.

On the morning of the 14th, the steamer "Hellenis" arrived in five days from Alexandria, with two passengers for Malta and three for Liverpool.

We have here an authentic account of all the ships and passengers which arrived at or touched at Malta from the return of the first detachment of pilgrims until quarantine was established on June 14th.

The vessels were 14 in number. They had on board 782 passengers, of whom 97 were landed at Malta; and of these only 36 were passengers for Malta. Showing that up to this date there had not been that great exodus of Maltese population from Egypt which is popularly believed.

None of the vessels had any choleraic disease on board, and the last of them had left Alexandria on the 9th of June, or three days before cholera appeared among the general population of the city.

No connection was ever traced between the arrival of these vessels and the subsequent appearance of cholera in the Islands.

Any evidence of importation of the disease, if it were imported, must, therefore, be sought in facts which subsequently occurred.

d. *Quarantine Arrangements at Malta.*

The history of cholera, after the establishment of quarantine at Malta on June 14th, affords well-ascertained facts of great interest.

But before proceeding further, it appears to be advisable to give a short sketch of the quarantine arrangements at this period; and to enable these to be understood I have shown on Plan I. the relation of various parts of the establishment to each other, and to the plague hospital in which the first outbreak of cholera occurred.

For the present purpose we may consider the quarantine establishment as consisting of three parts—

1st. The quarantine ground where ships were anchored.
2nd. The Lazzaretto.
3rd. The plague hospital.

1. The usual quarantine ground extends from Tascibiesc, at which the vessels are shown on the plan up the harbour in front of the Lazzaretto. But the practice at the time in June 1865, as stated to me by the quarantine authorities, was that vessels as they

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* The following note on this case is given in another list by Dr. Ghio:—"One of the crew, who had been previously suffering from bowel complaint, died during the passage, and the body was thrown overboard." If really were a case of cholera, the fact would show that this man had been affected by the epidemic ly three cases of cholera had taken place in Alexandria amongst the mixed group of pilgrims and re the disease first appeared, and at least six days before the general population of Alexandria was

arrived went across to Tascibiesc, where they cast anchor as shown on the plan. As soon as the necessary formalities were gone through, the ship's boats were lowered, and the passengers were rowed directly across the harbour to the quarantine jetty and there landed. If the vessel required no coals and the captain did not wish to ride out his quarantine he left the harbour immediately, and this was the course followed at the time referred to, the passengers only were left in quarantine. If coals were required they were put on board by the coal gang, and the vessel sailed immediately.

So far as concerns any accumulation of vessels on the quarantine ground from which infection might have proceeded before cholera appeared in the plague hospital, there certainly was none. The anchoring ground, moreover, is above 400 yards from the hospital.

After cholera had become established in the Islands there were vessels in quarantine, but the present question relates to what took place before cholera appeared in Malta.

2. As regards the quarantine establishment, the following general description given of it by Captain Galton and myself in our "Report on the Sanitary Condition of the "Mediterranean Stations" is sufficient to show what sort of place it is, and how altogether unsuitable it was for the accommodation of a number of people during an epidemic season :—

"The Lazzaretto proper is a complicated series of buildings, apparently constructed at different times, and without any regard to sanitary considerations.

"It contains many apartments of various dimensions; some of them very large, dark, and without ventilation; others smaller, and with more light and air. The courts are all closed, and surrounded by the high walls of the buildings, which stagnate the air, from which most of the ventilation, such as it is, is derived. Taken as a whole, although better than some other quarantine establishments in the Mediterranean, this Lazzaretto is not a fit place for habitation, and it has been planned apparently more under the influence of fear than of an enlightened consideration for health."

3. The plague hospital where the first outbreak of cholera appeared is described in the same report, as follows :—

"The plague hospital is a very singular specimen of hospital architecture. It consists of three double rows of cells about 12 feet by 9 feet, built back to back. The cells are on the ground, and the rows are separated by narrow alleys from each other. The whole hospital is surrounded by walls higher than itself, and is about the last place where a case of severe febrile disease might be expected to progress favourably. The only part of the establishment at all fit for sick is the medical officer's quarters, which face the sea and cut off the ventilation on that side."

A careful examination made of the buildings during this inquiry, by the light of experience afforded by the late epidemic of cholera, has convinced me that neither the lazaretto nor plague hospital ought to be occupied when an epidemic is threatened, and that there are local causes in both of them sufficient to have called the disease into existence among susceptible persons, quite apart from any question of importation.

There is a difference of level between the lower floor of the Lazzaretto buildings and the ground rising immediately behind them of between 25 and 30 feet. The site has in part been obtained by cutting a shelf in the rock, a position always dangerous to health when epidemic diseases prevail.

There are many apartments in the Lazzaretto without any through draught; rooms entering from rooms; insufficient window space and no adequate means of ventilation. There are several small damp courts enclosed by high walls of buildings, round which, and on the ground-floor, are long continuous apartments, fitted up with a kind of guard-room bench of wood, on which hundreds of people had to sleep. The only ground for obtaining exercise or fresh air was the damp surface of the court or the narrow foot-way in front towards the quarantine harbour. All the arrangements for drainage, water supply, and personal cleanliness appear to have been most deficient, and, nevertheless, into this place were crowded at one time nearly 1,400 people, most of them in a very filthy condition, and coming out of ships some of which were as filthy as themselves. One small room was pointed out to me in which 14 apparently healthy persons were placed, and of this number five were seized with cholera, together with their guardian, after having escaped the dangers of the crowded filthy ship which carried them from Alexandria. From first to last there were 20 cases of cholera among people placed in quarantine in these buildings, of which no fewer than 12 proved fatal. Three cases, two of which died, were landed from ships, all the others were developed in the Lazzaretto.

As a striking contrast to this fatality it may be stated that on the ground immedi[illegible] behind the Lazzaretto, about 30 feet higher, and at a distance of about 100 ya[illegible]

part of the soldiers' quarters in Fort Manoel, which were occupied during the entire time when the Lazzarretto was crowded with people, among whom these cholera cases were taking place. The men's rooms were clean, and well-ventilated, and not a single case of cholera, occurred in them.

The plague hospital which I also examined, was no more adapted for safe occupation during an epidemic period than the Lazzaretto. Besides the bad general plan and construction of the building, its water supply is defective and not connected with the drainage, the condition of privies and drainage was most unwholesome, and long before cholera appeared there was nuisance from the margin of the harbour and from a privy overhanging the water close to the buildings.

Bearing these points in mind we shall be better able to understand the facts connected with the arrival of ships in quarantine and the first outbreak of cholera.

As already stated quarantine was established at Malta against arrivals from Alexandria on June 14th. On the same day at 5 p.m. the steamer "Memnon" arrived in four days from Alexandria, and went over to Tascibiesc as shown in the plan. She had 22 passengers for Malta, of whom 11 were pilgrims. The master reported that one pilgrim had died of bowel complaint during the voyage and had been buried at sea.

Table V. shows that there were no cases of disease among the passengers or crew of this vessel while in quarantine.

On the same day, June 14th, two other vessels, the British steamer "Cairo" with 47 passengers on board for Malta, of whom 37 were pilgrims, and the Peninsular and Oriental Company's ship "Nyanza" with seven passengers for Malta, arrived in quarantine. None of the passengers were ill at the time or subsequently. By comparing the dates it will be seen that these three vessels had left Alexandria two days before cholera had established itself there, and four days before the consuls considered it necessary to inform their governments of the fact.

The subsequent arrivals, however, would have left Alexandria after cholera was in the city.

There were no arrivals on the 15th and 16th, but on the 17th the Turkish steamer "Maria Antoinette" came into harbour with one passenger in good health on board for Malta.

There was no arrival on the 18th.

On the 19th the French steamer "Assyrien" landed 30 passengers at the Lazzaretto, apparently in health.

On the 20th, at 7.30 a.m., the British steamer "Rhone" arrived, and afterwards landed 147 passengers at the Lazzaretto. The master stated that a passenger and a fireman had died of cholera during the passage. All the other passengers were apparently in health.

On this day, the 20th, there were 254 passengers in quarantine besides health guards and persons who had held communication with them. There was no sickness among them. The first case of diarrhœa in quarantine, found by Dr. Grellet on taking charge, was on the 23rd in a man who landed from the "Christina" on the 22nd. On the same day, the 23rd, there was a case of diarrhœa with vomiting in a woman who had landed from the "Rhone," and on the 24th there were two cases of diarrhœa in men who had also landed from the "Rhone." These cases all recovered, as did also a case of diarrhœa with vomiting which had shown itself on the 26th June in a man landed from the "Italian" on the 23rd.

The first case of cholera landed from a vessel coming from Alexandria was on June 28th.

On this date arrived the "Wyvern" with 302 passengers who were landed at the Lazzaretto, and among them a man in the state of collapse. He died at the landing jetty. On the same day another case was landed which recovered on July 8th. On the same day a case took place in a passenger who was landed from this ship. The passengers from the "Wyvern" were described to me as having been in a very filthy condition. They yielded, from first to last, 11 cases of cholera, two of severe diarrhœa and eight deaths.

The details regarding the ships in quarantine, given in Table V., show that between the 14th June and 31st July there were 38 vessels with passengers and crews placed in quarantine. That 2,031 passengers, 138 persons in communication with them, and 134 health guards were in the Lazzaretto at one time or another.

The following abstract gives the amount of disease among them :—

	Numbers placed in Quarantine.	Landed from Ships.				Occurred in the Lazzaretto.			
		Diarrhœa.		Cholera.		Diarrhœa.		Cholera.	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Passengers - -	2,031	—	—	3	2	16	—	14	8
Health Guards -	134	—	—	—	—	—	—	1	1
Coal Labourers,* &c.	138	—	—	—	—	1	—	5	3
Total - -	2,303	—	—	3	2	17	—	20	12

e. *Outbreak of Cholera in the Plague Hospital.*

I shall next proceed to inquire what relation existed between these cases of disease and the earliest appearance of cholera in Malta itself. Here again the dates become of great importance.

We have seen that the earliest case of diarrhœa, in arrivals from Alexandria, was brought under treatment on June 23rd in a man landed on the preceding day, and that the first case of cholera was landed on the 28th. There is absolutely no evidence of the occurrence of any previous cases. But before either of these dates Asiatic cholera was already in the island, and it first broke out, neither among persons who had come from Alexandria nor among the Maltese population, but among soldiers' families living in the plague hospital.

The following are the facts regarding this remarkable occurrence.

The miserable cells of the plague hospital had been crowded by 34 families of part of the royal artillery and of part of the 2/8th regiment. We have already seen what was the condition of the drainage at the period. When cholera showed itself the drains appear to have been full of filth, because the nuisance from the drain traps and privies, as well as from the beach, became very great and was much complained of. A most important point in this history is that diarrhœa had existed among the families for some time previously due apparently to the bad sanitary condition of their quarters.

Matters being in this state, on June 20th, about nine o'clock at night, a child of one of the families was seized with true Asiatic cholera and died in seven hours.

This was the first indigenous case of the Malta epidemic of 1865.

The distance from the nearest point of the plague hospital, where the case occurred, to the nearest point of the Lazzaretto buildings, as stated by the superintendent of police, is 662 feet, and the two establishments are besides cut off from each other by two or rather by three high walls. The distance of the plague hospital from Tascibiesc, where passengers where discharged from the vessels, was 1,300 or 1,400 feet, and the distance from the landing jetty at the Lazzaretto to the plague hospital was nearly the same.

On June 22nd, the next case took place in a woman living in another of the cells of the plague hospital at a short distance from the first case. The third case, on the 23rd, was the mother of the child first attacked. On the 27th two cases of choleraic diarrhœa took place in a man and a child living in another row of the buildings, and on the 29th another man and a child were attacked with cholera.

It is a remarkable proof of the extreme and exceptional virulence of the disease, that of these seven cases of cholera and choleraic diarrhœa all died except one.

f. *Chronology of Events.*

As there can be no doubt that on June 20th the first case of true cholera showed itself in Malta, and that it was the commencement of a severe outbreak in the plague hospital, this appears to be the proper place to give a brief chronology of the events up to this date.

* All the cases of cholera and diarrhœa among coal labourers took place within two days, in a party who were landed at the Lazzaretto on the 5th July, and placed in one of the divisions of the old ho[spital] apart for lodging them,—a very likely place in which to develop cholera during an epidemic season.

Dates.	Events.
1865.	
January 1 and onwards -	Gastric and diarrhœal diseases unusually prevalent among the population.
January and onwards -	Typhus prevalent in Malta in villages subsequently the seats of cholera. Fever mortality double the average.
January and onwards -	A diarrhœal disease (so called gastro-enteritis) occasioned double the average mortality in Malta.
March - - -	Fatal typhus prevalent at Mecca, Medina, and Djedda.
April - - -	Epizootic disease prevalent in the East. Importation of cattle prohibited in Malta April 29.
May (first weeks of) -	Cholera in Arabia.
May 17 - - -	Severe outbreak of diarrhœal disease, mistaken for cholera and reported as such, at Birchircara, Malta.
„ 19 - - -	First vessel with pilgrims from Djedda arrives at Suez.
„ 20 - - -	Severe outbreak of diarrhœal disease with choleraic symptoms among soldiers' families in the Lazzaretto, Malta.
„ 21 - - -	Cholera at Suez in a master of a vessel and his wife.
„ 22 - - -	A case of cholera among pilgrims at Damanhour, near Alexandria.
„ 22 to June 1 -	Several thousand pilgrims landed at Suez, and encamped at Alexandria.
„ 26 - - -	Steamer "Ephesus" leaves Alexandria; arrives all well at Malta on the 31st.
June 2 - - -	First case among inhabitants of Alexandria living among pilgrims.
„ 4 - - -	At and before this date seven steamers leave Alexandria and arrive all well at Malta between 1st and 9th June.
„ 5 - - -	Two other cases of cholera among persons living with pilgrims at Alexandria.
„ 6 - - -	Steamer "Olympus" leaves Alexandria, arriving on the 10th at Malta, having had one case of diarrhœa among the crew.
„ 8 - - -	Steamer "Alexandra" leaves Alexandria; arrives at Malta on the 13th all well.
„ 9 - - -	Three Peninsular and Oriental Company's steamers leave Alexandria and arrive at Malta all well on the 12th.
„ 9 - - -	"Hellenis" leaves Alexandria and arrives at Malta on the 14th all well.
„ 10 - - -	Steamer "Memnon" leaves Alexandria, one death from "bowel complaint" on the voyage; arrives all well at Malta in quarantine on the 14th.
„ 10 - - -	The "Cairo" and "Nyanza" leave Alexandria; arrive all well in quarantine at Malta on the 14th.
„ 12 - - -	Cholera in Alexandria.
„ 12 - - -	"Maria Antoinette" leaves Alexandria; arrives, all well, in quarantine at Malta on the 17th.
„ 14 - - -	Consul at Alexandria telegraphs to Malta the existence of cholera in Alexandria.
„ 14 - - -	Government of Malta places arrivals from Alexandria in seven days' quarantine.
„ 15 - - -	"Assyrien" leaves Alexandria and arrives, all well, in quarantine at Malta on the 19th.
„ 15 - - -	Premonitory diarrhœa more than usually prevalent in the Ospizio Floriana about this date.
„ 16 - - -	Steamer "Rhone" leaves Alexandria; loses a passenger and fireman from Cholera on the voyage; arrives all well in quarantine at Malta on the 20th.
„ 20 - - -	Diarrhœa having prevailed among soldiers' families in the plague hospital, Malta, for some time previously, the first case of Asiatic cholera (fatal) in Malta took place in the plague hospital on this date in a soldier's child. No disease in the "Lazzaretto."
„ 22 - - -	Second and third cases of cholera (fatal) among soldiers' families in the plague hospital.
„ 23 - - -	First case of diarrhœa among passengers in the "Lazzaretto."
„ 27 - - -	Two cases (one fatal) in the plague hospital.
„ 28 - - -	Arrival of "Wyvern." First case of Asiatic cholera in the "Lazzaretto."

On considering these facts it appears to be impossible to evade the conclusion that the first indigenous case of cholera in Malta had no connexion with any previous case, and that there is no evidence to sustain the popular idea of the disease having been imported. So far as dates are concerned it might be asserted with more plausibility that the disease really passed from the plague hospital to the Lazzaretto, but there is no evidence either of the one event or of the other. On the contrary, there is evidence that a change, presaging the advent of an epidemic, had been taking place for months in the public health of the Islands, and the epidemic when it did arrive attacked a locality in regard to the pre-eminently bad sanitary conditions of which there is no difference of opinion.*

* At a subsequent period, after the plague hospital had been evacuated, cleansed, and fumigated, a number [illegible]ngers were removed into it from the Lazzaretto, and among these two cases of cholera occurred, one [illegible]h, the other on the 16th of July. Unfortunately, the real defects of the building could be removed [illegible]ime washing nor by fumigation.

g. *Local Causes of Cholera in the Plague Hospital.*

The remarkable outburst in the plague hospital admits of being employed to a certain extent as a test of the correctness of several prevailing opinions as to the manner in which cholera is propagated.

The plague hospital as shown in the map is a detached isolated establishment with no population near it. It is enclosed within high walls; between it and the Lazzaretto is an old burial ground in which bodies of persons dying in quarantine are interred. There is no communication between the plague hospital and the Lazzaretto except through doors in the several walls which are kept locked. As already stated, the buildings consist of ranges of back to back cells each with its own door. Each cell has 108 square feet of floor space, which was the extent of area allotted to a family. There were 34 families, men, women, and children in the buildings.

The drains are of the usual Maltese construction, they follow the line of the buildings and are discharged into the tideless harbour close to the hospital; with these drains are connected the privies. There is no adequate supply of water to cleanse the drains, and they are nothing but cesspits close to dwellings. Great nuisance proceeded from them at, and before the outbreak of cholera, when the people were suffering from diarrhœa. Another source of nuisance was a privy placed over the margin of the harbour close at hand. Ventilation, both external and internal was most defective, so much so that after cholera broke out, part of the enclosing wall had to be pulled down to admit air to the buildings.

Among known predisposing causes of cholera there were present in this case,—

Bad construction of dwellings.

Bad and offensive privies and drains, or rather cesspits close to the rooms.

Overcrowding. Insufficient ventilation.

Water supply insufficient for cleansing the drains.

At this point we arrive at an important question; viz., the quality of the water.

Among predisposing causes of cholera there cannot be a doubt that the use of water containing organic matter, especially animal organic matter in a state of decomposition must be ranked as one of the most energetic and fatal in its action. In the present case this element was certainly wanting, for the water supply of this hospital is perhaps the purest in the island. It is indeed unusually pure as will be seen by the following analysis made at my request by Mr. Abel of Woolwich, and extracted from his report, Appendix XXIII.

	Grains per Imperial Gallon.
Total solids (by direct determination) - -	15·85
Carbonate of lime - - - - -	8·70
Carbonate of magnesia - - - - -	1·06
Sulphate of soda - - - - -	0·85
Chloride of sodium - - - - -	4·14
Organic and other volatile matters - - -	0·40

In this case we must exclude impure water from the chain of causes.

The hypothesis that cholera is propagated by emanations from excreta receives no countenance, at least in so far as the first case is concerned, for it is certain that there was in this instance a first case in the plague hospital, and that this first case was the first in the island in the year 1865.

In like manner the events give no countenance to any hypothesis as to epidemics taking their origin from specific cholera germs, communicated either by water or by personal intercourse. The first case in the plague hospital occurred before there was any possible channel of communication between it and any antecedent case elsewhere.

All we know is, that there was a coming epidemic of cholera, that there were present certain bad sanitary conditions which are well known from experience to be predisposing causes of cholera when cholera is imminent. Why a child in the plague hospital should have been the first victim, or what other agency was requisite to give rise to the first cholera case, or to cause the existing diarrhœa to pass into cholera, are questions beyond our power to answer.

In as far as regards new cholera cases, which took place among passengers and others in quarantine, there is no conclusive evidence that all the cases were simply due to imp[illegible] tation. On the contrary, these persons were exposed to the influence of bad loc[illegible] defective ventilation, bad drainage, overcrowding into masses within a small [illegible] instead of having been separated into small numbers over a large area. They [illegible]

many of them in fear, in overcrowded dirty ships, from a place where cholera existed; they were themselves of unclean habits, and many of them had very bad accommodation in the Lazzaretto. Moreover, cholera had actually broken out within 662 feet of them before any of themselves were affected even with diarrhœa. Considering the susceptible condition in which many of the people arrived, it is possible that some of them at least may have suffered from the very precautions taken to prevent cholera passing from them into the island. The real wonder is that no greater number died while in quarantine, considering the unfavourable circumstances in which they were placed.

III.—Account of the earlier Cases of Cholera in the Islands.

I shall next proceed to give some account of cases of Asiatic cholera which occurred during the first month of the epidemic in Malta. This period will be amply sufficient to show the law of development of the disease.

We have seen that the first outbreak of the disease occurred in the plague hospital, and that between the 20th and 29th of June six deaths out of seven cases had taken place there. Apparently all the true cholera attacks had proved fatal.

The fifth case in order of date, however, was that of a man who was employed in the plague hospital in lime washing the affected rooms, on the 27th June, after the disease had been about a week in the place. This man was seized with diarrhœa the same day, he then went to Casal Attard, a village about three and a half miles west of the plague hospital, where he lived. Symptoms of cholera came on on the morning of the 28th, and he died at 6·30 a.m. on the 29th. This case was the first instance of the disease having been imported from a place where it existed in great intensity to a village in which there was no cholera, but where the local conditions were favourable to its spreading.

Personal communication and favouring local conditions both were present, but no result except the death of the man followed.

The next case of cholera in Attard took place on August 8th six weeks later in another part of the village and there was no connexion between the cases.

At the time of the first death at Attard, the families in the plague hospital were removed out of it, and the occurrences which followed afford a striking confirmation of two well-known laws of cholera. 1st. That when cholera exists in a given population it can be moved with it. 2nd. That unless the population be broken up and scattered in an airy healthy locality, the disease will continue its ravages.

Eleven hundred yards to the south of the plague hospital, and on the opposite side of the quarantine harbour, is situated a small counterguard, "St. Salvatore," on the slope of the hill between Floriana barracks and the water. On the land side of it rises a lofty curtain, and on the water side it is enclosed by high works, forming a bastion mounting guns. The space for men is between the outer and inner walls, and consists of a long narrow well, almost like a water tank when looked down into from above; the only entrance to which is by an archway and gate on one side. The casemates are constructed under the terre-pleine of the battery, and their only light and ventilation is derived from the well referred to.

The whole place is unfit for occupation as a barrack because it cannot be sufficiently ventilated and for other reasons.

On July 1st the remains of the 34 families, all suffering more or less from the usual premonitions of cholera, were removed from the plague hospital. The families of the royal artillery were placed partly in casemates, partly in tents at St. Salvatore. Those belonging to the 2/8th regiment were taken to the Crown work outside Floriana.

On the same afternoon, July 1st, six women were attacked with cholera in the casemates of St. Salvatore, fortunately only one woman died. On July 2nd another woman was attacked and died in the casemates.

Up to this date there had been no case of cholera among the civil population of the island, excepting the Attard case. Next day, July 3rd, the first civil case of cholera took place in No. 96, Strada Vescovo in the middle of Valletta, about 1,500 yards from St. Salvatore and 1,000 yards from the occupied portion of the Lazzaretto, where there were only two cases under treatment on the 3rd, one of which died on this day.

The following are the notes of the case in Strada Vescovo taken down from Dr. Ghio's dictation.

"The first case of cholera in Valletta took place in a woman named Schembri, a dressmaker, Strado Vescovo, No. 96. Had diarrhœa six days before attack, which she neglected. Went on June 30th, early in the morning, to St. Julians, returned about 10 o'clock to Strada Vescovo; on the 2nd July had diarrhœa again, and about noon on the 3rd she had headache and fainting fits. At 4 p.m. she was seized with a sudden violent attack of cholera, of which she died at midnight."

This woman had not been in contact with any cholera case. The history, indeed, shows it to have been a pure epidemic case, differing in no respect from other epidemic seizures.

There was no fresh case for the next three days. But on the 6th July three children belonging to soldiers' families were attacked in the tents at St. Salvatore, and one of them died.* On the same day a case occurred in a soldier in Fort Ricasoli, on the opposite side of the great harbour and upwards of 2,500 yards from St. Salvatore. It proved fatal next day. The sufferer is stated, by Dr. Boileau who was in charge, to have been an old weakly soldier who had arrived with the regiment on the 1st July from England. The disease wanted some symptoms of true Asiatic cholera. It was nevertheless rapidly fatal, and is considered to have been a sporadic case. There was no further disease at Fort Ricasoli until a month later.

On July 7th, a fatal case took place in a soldier in the tents at St. Salvatore.

Next day, the 8th, a female child, aged 19 months, died of cholerine at No. 223, Strada Manderaggio, one of the worst localities in Valletta.

In Mr. Inglott's report already referred to, it has been shown that premonitory symptoms began to prevail in the "Ospizio" at Floriana in the middle of June, and that fatal cases of diarrhœa showed themselves early in July. The first of these fatal diarrhœa cases took place in an invalid at the Ospizio on July 8th, and is returned in Dr. Ghio's list as cholera, although Mr. Inglott gives July 16th as the date of the first confirmed cholera case in the Ospizio, registered as such by the medical officer.

On July 9th a soldier's wife was seized in the casemates, St. Salvatore, and died.

On the same day a soldier belonging to Fort Tigne, who had been on fatigue duty at the tents at St. Salvatore, was attacked and died in the general hospital.

On the 10th another fatal case of diarrhœa, entered on Dr. Ghio's list as cholera, took place in the Ospizio.

On the same day there was a case at No. 17, Strada San Michele, Cospicua, 2,500 yards away, on the opposite side of the great harbour. This was the second case (counting the fatal case at Fort Ricasoli as one) on the side of the great harbour opposite Valletta.

Next day, the 11th July, a boy employed as a servant in the telegraph office, No. 7, Strada Marsamucetto, not near any other case, was seized in the office, and went to his mother's house in Strada Zecca where he died.

On the same day a child was seized with cholera in the tents of St. Salvatore and recovered.

Next day there were two cases at Floriana, one a fatal diarrhœa case in the Ospizio, the other at 64, Conservatorio, a street with houses in a very bad sanitary condition opposite the civil hospital.

On the 13th, there was another fatal diarrhœa case in the Ospizio and two other cases in Cospicua, one at No. 17, Strada San Michele, where a case had taken place on the 10th, the other at No. 39, Strada San Marco, this latter case is stated to have been fatal diarrhœa. On the same day cholera first appeared in Floriana barrack, attacking two soldiers one of whom died. A fatal case likewise occurred in a woman living in the left Horn work 700 yards away.

On July 14th there were five new cases. One of these took place in a gentleman who had arrived in health on the 1st of July from Alexandria, in a Peninsular and Oriental Company's steamer. He was seven days in quarantine, during which he suffered

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* It may be well to mention that the 2nd Battalion, 22nd regiment, left Malta on this date on board the "Orontes" for Gibraltar, and afterwards lost two men from cholera there, although it has never been more than hinted that possibly the regiment got the infection from St. Salvatore, on account of the "Orontes" having taken the men on board near a sewer proceeding from the fort into the harbour. The facts are the following :—The regiment was quartered at Pembroke camp, about three miles away. There was no cholera there. It was marched through Floriana on July 5th and 6th, to the hay wharf, off which the "Orontes" was lying. On the route it never was near St. Salvatore or any affected locality. The sewer mouth is a small opening under water 200 yards or more distant from where the "Orontes" was moored. Injury from it was perfectly impossible, and the dates in the text show that the regiment got on board while there was a cessation of attacks. The vessel sailed on the 6th.

The first epidemic case at Pembroke camp took place in a child living in one of the wooden huts. It was seized with diarrhœa on the 15th and died on the 19th July. This case was immediately followed by [illegible] fatal cases of cholera in the same family. Is it possible that the 2/22nd regiment when it left Malta [illegible] least that some of the men, might have become already predisposed to cholera under the general epidemic constitution then prevailing, and that the disease was developed at Gibraltar by unhealthy local conditions? The first case in this regiment proved fatal at Gibraltar on the very day the child died at Pembroke. The next day, the 20th, the child's mother was seized with cholera.

not from diarrhœa but from constipation. A week after, landing at Valletta, he died of cholera at No. 37, Strada Mezzodi. This was the only case in the house.

The same day a fatal case of diarrhœa took place in the Ospizio, there were two cases in Strada Miratore, Floriana, and a fatal case in a soldier in Floriana barrack.

July 16th was marked by an epidemic outbreak more severe than any which had yet occurred. On this day there were no fewer than 13 cases of Asiatic cholera. In Valletta there was a fatal case in Strada Reale, another in Marsamuscetto, and another in Strada Brittanica. The two last were children who had come from Alexandria on the 2nd July, and left the Lazzaretto for their own homes in good health after performing 12 days' quarantine, there had been cholera on board the "Cella," the ship in which they came.

In Floriana there were four cases, one of these was the first fatal case returned as true cholera in the Ospizio, another case occurred in the Piazza Maggiore, a third was taken ill in the open street, a fourth in the left Horn work, fatal in a soldier there.

At Cospicua a case occurred in Vicolo Marina, No. 53.

On this day the first epidemic case, at a distance from Valletta, took place at Rabato, in Strada Doni, six miles away. No connexion is known to have existed between this and any other case. The disease also appeared in a street called Concezione, at Misida, at the upper end of Misida creek. Dr. Ghio states that two women who suffered were laundresses who had washed the linen of the gentleman who died in Strada Mezzodi, Valletta, on the 14th two days before. On the same day, the 16th, on which these women were attacked, a gentleman, living in another house, No. 119, Concezione, in the same street where these women lived, was also seized. The reason assigned for his fatal illness was that one or both of the washerwomen had frequented his house.

The case in Strada Mezzodi took place on the 14th, and proved fatal the same day. And to estimate the value of the chain of sequence we must bear in mind that the women had to fetch the linen, and wash it, and they had besides to communicate the disease to their neighbour; and yet the whole three were attacked and died on the 16th.

On the 16th a soldier was seized with cholera in Upper St. Elmo barrack.

Next day, the 17th, there was another case in Upper St. Elmo, and there were 12 other cases scattered over the garrison.

One of these was at 83, Strada San Giuseppe, in Valletta.

Floriana furnished eight cases, three of which were in the Ospizio, and one in the Central Civil Hospital. There was a case in Miratore, another in Piazza Maggiore, two in Strada Mercato.

There were two cases in Cospicua, and one at Misida.

The 18th July gave nine new cases. Three of these took place in Lower St. Elmo, Strada Fontana, Strada St. Giuseppe, No. 83. There was one case in No. 46, Campanile, in Cospicua. There were four in Misida, and on this day the first case of cholera took place at Birchircara, two months after the outbreak of choleraic disease there.

On July 19th there was a case in Strada St. Paolo, Valletta, and another case across the great harbour at Corradino.

Next day, the 20th, showed a great and sudden increase of the disease, to which Valletta contributed 10 cases, three in the Manderaggio, one in Marsamuscetto, two in Strada Reale, one in Strada Fontana, one in Strada Frederico, and one in Strada Fianco.

There were six cases in Floriana, two in the Ospizio, two in Strada St. Anna, and two in the Central Hospital.

A case took place in a man on board a vessel in French Creek, Cospicua.

There was a second case in Strada Doni, at Rabato, six miles distant; there were three cases at Misida, and one at 29, Del Quartiere, in Vittoriosa. There were thus 22 cases in all, scattered most of them over the garrison, although confined to the civil population.

During the month from June 20th to July 20th inclusive, there were thus 100 cases, civil and military, in the island, besides cases in quarantine. I have had these cases transferred to map No. I., which shows the locality of all of them, except of one attacked in the street in Floriana.

The cases divide themselves into three groups. The first and most important was [illegible]roup which had its origin in the plague hospital, and which was transferred with [illegible]ple to St. Salvatore, Floriana. The second group consisted of the "Ospizio" [illegible]ich, as seen on the map, have an apparent connexion with the cases in [illegible]e. But no such connexion has ever been alleged. The outbreak in the

Ospizio had as distinct a beginning and development as that in the plague hospital. The inmates suffered from premonitory diarrhœa, while this disease existed among the inmates of the plague hospital; the premonitory diarrhœa was followed by fatal diarrhœa, and then by Asiatic cholera.

Before the recent sanitary improvements in the "Ospizio" cholera generally located itself among the inmates before attacking any one else. During the late epidemic, cholera had existed a fortnight among the civil population before the first case took place in the Ospizio.

The third group of cases consists of those which occurred among the general civil population. These, as is shown by the map, were scattered over the garrison irregularly, both in time, locality, and distance. With two or three exceptions all of these earlier cases occurred at the rate of one case per house, and there is no evidence of the spread of the disease being due to the transfer of any virus.

We shall obtain further means of judging when we come to consider the distribution of cholera deaths, but the statistical facts regarding these earlier cases, although they neither affirm nor deny the communicability of cholera, certainly afford no evidence in support of the view that the epidemic of 1865 was occasioned by a specific virus having been conveyed by intercourse from house to house, or from person to person.

By the 20th July the epidemic may be considered as having become fairly established in Malta, and I shall next state the order in which the different towns and villages were attacked.

The map, No. II., shows the position of each group of population, together with the dates of attack.

The following table gives the date of the first case in each city and village, together with the distance of successive first cases.

It will be seen that the facts afford no evidence of cholera having radiated from any centre or centres. On successive days, and even on the same days, it attacked places miles apart from each other, sometimes at the opposite extremities of the island.

TABLE of DATES and DISTANCES of SUCCESSIVE FIRST CASES of CHOLERA in MALTA.

Name of City or Village.	Date of First Case of Cholera.	Distance in Yards of Places successively attacked.	Name of City or Village.	Date of First Case of Cholera.	Distance in Yards of Places successively attacked.
Attard	June 29	—	Zurrico	July 27	10,300
Valletta	July 3	7,000	San Giuliano	„ 27	11,000
Cospicua	„ 10	2,500	Gargur	„ 28	3,520
Floriana	„ 12	2,200	Zeitun	„ 29	11,500
Misida	„ 16	1,700	Calcara	„ 30	4,500
Rabato	„ 16	8,800	Gudia	„ 31	5,700
Birchircara	„ 18	7,000	Axiack	August 4	1,350
Corradino	„ 19	5,700	Balzan	„ 5	8,500
Vittorioso	„ 20	1,100	Lia	„ 6	450
Curmi	„ 21	5,250	Paola	„ 7	7,000
Musta	„ 21	6,000	Tarxien	„ 8	850
Senglea	„ 22	8,800	Siggieui	„ 8	7,000
Naxaro	„ 22	7,500	Crendi	„ 8	2,600
Micabiba	„ 23	8,800	Luca	„ 12	3,500
Zebbug	„ 24	3,500	Melleha	„ 12	17,000
Zabbar	„ 24	8,000	St. Paul's Bay	„ 15	3,600
Via St. Guiseppe	„ 24	7,000	Safi	„ 15	15,500
Sliema	„ 25	3,500	Chircop	„ 17	1,300
			Dingli	„ 27	10,500

On July 21st, the day on which cholera appeared in the villages of Curmi and Musta, in Malta, the first case of cholera took place in the island of Gozo.

The circumstances are stated by Dr. Ghio, as follow:—

"On the 21st July, Michele Cilia, aged 22 years, a seaman employed in a coasting boat, returned to Gozo after nine days stay at Malta. He arrived at Casal Xeuchia, the place of his residence, at about 3 o'clock p.m., suffering from diarrhœa. During the ensuing night he was seized with cholera, but recovered."

This man is believed to have imported cholera into Gozo. I shall discuss the evidence for this opinion afterwards. At present I shall simply state the statistical facts as they regard Gozo.

The next place attacked was Rabato, the capital of the island, where the first case took place on the 2nd August. On the day following a case occurred at C[illegible]

the 5th August there was a first case at Nadur, and another at Sannat. On the 7th, Marsalforn and Garbo each had a case. Munxar was attacked on the 10th, and Santa Lucia on the 11th. The first case in Kercem took place on the 15th, and in Zebbug on the 17th. There was only one case in Ghain Sielem, the port chiefly frequented by coasters from Malta, on the 7th September. The first case in Ghammar took place on the 9th, and there was one at Kala on the 18th September.

The following table, similar to the one already given for Malta, is abstracted from the map, and shows the distances of these earlier successive attacks from each other.

TABLE of DATES and DISTANCES of SUCCESSIVE FIRST CASES of CHOLERA in GOZO.

Name of City or Village.	Date of First Case of Cholera.	Distance in Yards of Places successively attacked.	Name of City or Village.	Date of First Case of Cholera.	Distance in Yards of Places successively attacked.
Xeuchia	July 21	—	Munxar	August 10	3,500
Rabato	August 2	2,600	Santa Lucia	„ 11	1,700
Caccia	„ 3	1,800	Kercem	„ 15	1,000
Nadur	„ 5	3,500	Zebbug	„ 17	2,500
Sannat	„ 5	4,500	Ghain Sielem	Sept. 7	7,000
Marsalforn	„ 7	5,500	Ghammar	„ 9	8,000
Garbo	„ 7	5,250	Kala	„ 18	—

This table shows no evidence of radiation of cholera from Xeuchia, its supposed point of importation. On the contrary, the disease comported itself very much as it did in Malta, attacking simultaneously and successively points at considerable distances from each other, and leaving the intervening country untouched.

IV.—DISTRIBUTION OF DEATHS FROM CHOLERA IN CITIES AND VILLAGES.

Statistical facts bearing on the distribution of deaths from cholera in the cities are full of interest, because, among other reasons, they admit to a certain extent of comparison with similar facts regarding the distribution of mortality from plague in 1813.

The difference of local position and construction of houses in the cities within the garrison is such that a satisfactory comparative estimate of the death rate from cholera solely in relation to the density of population can scarcely be arrived at. I shall, however, give the facts as brought out by the inquiry. In the following abstract the first column shows the number of inhabitants to 1,000 square yards in each city at the period of the census in 1861. The second column gives the death rates per 1,000 of the population from the cholera of 1865.

	Persons per 1,000 square yards.	Cholera deaths per 1,000.
Senglea	45	9
Cospicua	45	11
Valletta	49	11
Vittoriosa	53	18
Floriana	55	8

Floriana, the most densely peopled district, gives apparently the lowest death rate, but a glance at the map will show that Floriana is a small, regularly built, isolated town, and it has, moreover, always been the healthiest portion of the garrison.

The deaths from cholera were by no means equally distributed over the surface of the towns. As a general rule the disease was most intense on sloping ground, especially towards lower levels. The ridges and comparatively flat surfaces had few deaths, but this rule was of course modified by other local conditions connected with the sanitary state of houses, the habits of population, and the like. By referring to the map it will be seen, for example, how large a proportion of deaths took place round the outskirts of Senglea, on the lower levels overhanging the harbours, when compared with the scattered deaths along the central ridge of that town. The ground slopes rapidly from the ridge on both sides towards the water, but the worst class of dwellings is also there, and the better class of houses and population are found along the ridge.

Cospicua is nearly all built on sloping ground, and the comparative intensity of cholera in different districts of this town appears to have depended on other elements added to topographical position.

One observation may be made regarding Vittoriosa.

Valletta itself furnishes perhaps the best points of comparison as to the effects of position of houses on the intensity of cholera, and I shall select it for this purpose. A reference to the map will show that the city consists mainly of two sets of streets crossing each other at right angles. The lowest points of all the streets are those nearest the sea. The centre of the peninsula is an irregular ridge, partly sloping, partly flat, or nearly so, to which all the transverse streets ascend on both sides from the water.

The lowest point of Strada Reale is 50 feet above the sea level at St. Elmo, from which it rises to 153 feet at the Porta Reale in a length of 800 yards.

The next street to the east, Strada Mercanti, slopes upwards from 74 feet to 174 feet in the same distance.

The other longitudinal streets have a proportionate slope, but it is not continuous, from the irregular nature of the ground on the sides of the ridge.

The highest longitudinal street is Strada Mercanti, and all the transverse streets slope upwards towards it. The rise in the short transverse streets near St. Elmo to Strada Mercanti may be taken generally at 40 feet in a distance of 200 yards. Further up the town the slopes become much steeper and those on the south-east side have to be ascended by stairs. In several instances the rise in 140 or 150 yards is from 60 to 80 feet.

On the north-west side of the city the inclines are longer, but the rise is sometimes between 80 and 100 feet, and the plane of the slope is broken up into hollows.

Valletta is thus built on a high central ridge with rapid slopes down towards the sea.

There is, however, a considerable area, amounting to perhaps a fourth part of the entire surface of the town, which is comparatively level, and occupies the summit of the peninsula from the defensive works on the land side to the palace. Bearing these topographical facts in mind, let us now examine the localities of cholera deaths as shown on the map No. III. It will be at once evident how large a proportion of the deaths took place on the slopes and round the lower levels, and how small comparatively was the mortality in upper districts of the town. The map, however, shows two striking exceptions to this law, for on the highest point of the town it will be seen that there are two groups of deaths which are apparently out of place. These are due to exceptional local conditions of another kind altogether. They mark the two worst blocks of buildings in the upper part of Valletta. If they were cleared away, and all their bad sanitary arrangements removed with them, and if the ground were occupied by healthy dwellings, there would be no reason why the inhabitants should not escape cholera as much as any others in the vicinity.

A very important part of the inquiry was to ascertain by what apparent law the epidemic deaths were distributed among houses and over different parts of the same house, on account of the additional light which might in this way be obtained into the local favouring conditions of the disease.

The statistical facts of this portion of the investigation are given in Appendix XVIII., and I shall state the results.

As a rule, the houses in the garrison towns resemble in general construction and arrangement those usually met with in other Mediterranean cities. They are built with small narrow courts, round which the houses are arranged in floors. Most of the rooms are of the back to back construction, and have no thorough draft. Many houses of this class are separate occupancies, while others are let in separate apartments of one or two rooms, and are called common lodging houses. A house subdivided in this way is generally occupied by a number of families, using a common staircase and all conveniences in common, and has the appearance of being very densely peopled. Some better class houses are divided into floors, each of which is occupied by a family. Houses entering directly from streets and lanes are of a different construction. Many of these have no light or air except what they derive from the door or from a window on the same side as the door.

It will be seen that the word "house" includes buildings or tenancies of very different dimensions. In some cases a house contains few inmates, while in others it may contain some dozens.

In the country villages the construction of dwellings is, in the majority of instances, of a very different character. Villages in Malta and Gozo resemble nothing so much as aggregations of small farm buildings and farmyards each enclosed within its separate wall. Domestic arrangements are different in the villages from what they are in towns; they represent indeed a different civilization, and one of far higher

The enclosures are for the most part numbered as separate houses, and those I inspected were occupied by single families.

It is necessary to bear in mind these various constructive arrangements in order to understand the following statistical facts respecting the distribution of deaths from cholera.

I shall give these first for the cities and then for the villages.

The deaths from cholera in relation to houses within the garrison were as follow:—

Valletta	-	281	deaths in 223	houses.
Floriana	-	49	„ 48	„
Senglea	-	61	„ 53	„
Vittoriosa	-	106	„ 85	„
Cospicua (Burmola)	-	120	„ 86	„

In Valletta there were three deaths the exact localities of which were not known, and, excluding these, it appears from this summary that 617 deaths among the civil population of the garrison took place in 495 houses.

A further analysis of the table shows that most of the deaths were single, *i.e.*, that there was no more than one death per house.

The proportions in each city were—

Valletta	-	182	houses with one death per house.
Floriana	-	47	„ „
Senglea	-	46	„ „
Vittoriosa	-	70	„ „
Cospicua	-	66	„ „
Total	-	411	

It hence appears, that out of 495 houses in which people died of cholera, 411, or 83 per cent., of the houses yielded only one death per house, and that there were multiple deaths in 84 houses, or in 17 per cent. of the whole.

The number of deaths per house out of these 84 houses varied from two to six per house. The proportions for each city are as follow:—

	Number of Houses and Deaths per House.				
	Two.	Three.	Four.	Five.	Six.
Valletta - - - -	30	7	3	—	1*
Floriana - - - -	1	—	—	—	—
Senglea - - - -	6	1	—	—	—
Vittoriosa - - - -	12	1	1	1	—
Cospicua - - - -	11	5	3	1	—
	60	14	7	2	1

* Properly speaking there were five deaths in this house, as one of the persons died at Senglea, on the opposite side of the great harbour. A number of the other multiple deaths took place not in the houses but in the hospitals. Many of these multiple deaths were really multiple attacks which proved fatal not in the houses but elsewhere.

There were thus 60 houses each of which had two cholera deaths from among their inmates. In 14 houses there were three deaths per house, in seven houses four, in two five, and in one house in Valletta, a plan, elevation, and section of which are given in Plate No. VI., there were six deaths. Many of these houses, as already stated, contain a number of families, each having its own dwelling.

These facts show that, so far as concerns the distribution of deaths from cholera over the cities, the law of the disease was to occasion single deaths in separate families, and that multiple deaths were comparatively exceptional.

Table XIX. contains the deaths per house in the villages of Malta in relation to [illegible]itary condition.

[illegible]here were altogether 805 deaths in these villages, including 27 deaths which took [illegible]mong the inmates of Saura's hospital at Rabato, two deaths in Santa Spirito [illegible]and five deaths the particulars of which are not given in the returns. Excluding

these, we find that 631 village houses yielded 771 cholera deaths, and that the proportions of deaths to houses were as follow :—

514	houses yielded	- -	1	death each.
99	,,	- -	2	deaths ,,
15	,,	- -	3	,, ,,
2	,,	- -	4	,, ,,
1	,,	- -	6	,, ,,

Table XX. contains the corresponding facts for the island of Gozo.

In the villages of Gozo 192 houses yielded 231 deaths from cholera, distributed in the following proportions :—

161	houses yielded	- -	1	death each.
25	,,	- -	2	,,
5	,,	- -	3	,,
1	,,	- -	5	,,

The following is a summary of these statistical data :—

	Number of Houses and Deaths per House.					
	One.	Two.	Three.	Four.	Five.	Six.
Garrison towns - - -	411	60	14	7	2	1
Villages of Malta - - -	514	99	15	2	—	1
Villages of Gozo - - -	161	25	5	—	1	—
Total - -	1,086	184	34	9	3	2

We have in this table the topographical history of cholera mortality as it occurred in 1,318 houses, many of which contained several families, each in its own dwelling, or if we admit, for the sake of argument, that cholera is communicated by germs (one of the statements made to me at Malta), we have here the history of 1,318 centres of contagion. In 1,086 of these, or 82 per cent. of the entire number, there was only one death in each house, and in 232 there were more deaths than one per house. In a number of villages all the deaths were single deaths.

Even in the village of Xeuchia in Gozo, into which it was affirmed that cholera had been imported, out of 16 houses, yielding 18 deaths, 14 houses had no more than one death each.

We have already seen that in Valletta itself there was a great preponderance of deaths from cholera in houses situated on slopes, especially towards the lower levels; indeed, all the deaths except about 40 took place in houses built on, or at the foot of, steep sloping ground; and I shall next proceed to show the proportion of deaths from cholera in different parts of blocks of houses where fatal cases occurred.

One of the columns in Table XVIII. gives the number of deaths in each floor of the houses. But in order to understand this, it is necessary to state that there are not many inhabited underground basements in the garrison, and that the occupation of houses generally begins from the ground floor upwards. Most of the houses, however, being built on sloping ground, floors of ground floor rooms are not necessarily all at or above the level of the ground, because they may have higher levels close to them, and may be on this account really partially below the level.

The following summary from Table XVIII. shows the number of deaths from cholera on each floor of houses where there were deaths within the garrison :—

	Number of Deaths among the Population living in								
	Basements.	Ground Floors.	Mezzanini.	1st Floors.	2nd Floors.	3rd Floors.	4th Floors.	Terraces.	Doubtful.
Valletta - - -	8	72	80	43	44	22	4	4	7
Floriana - - -	1	10	18	2	11	4	2	—	1
Senglea - - -	—	18	12	19	7	2	—	—	2
Vittoriosa - - -	—	36	13	45	5	1	—	3	
Cospicua - - -	6	66	7	28	5	—	—	1	
	15	202	130	137	72	29	6		

Before a precise estimate could be arrived at as to the value of these numbers, it would of course be requisite to know what the population of each floor in every house was at the time cholera prevailed. This would be impracticable, and we must therefore take the numbers as they are, and endeavour to understand their meaning by comparing them with the elevations and sections of houses shown on Plans V. and VI. In the preceding summary the different parts of the houses are arranged in their order from below upwards. The mezzanine, although above the ground floor, differs little, if at all, from this floor in its sanitary relations, and it would be perfectly safe in estimating the relative mortality of different floors to group the basements, ground floors, and mezzanini together.

The total deaths in the preceding summary are 620; from these 21 must be excluded on account of imperfect description. This will give 599 deaths which have to be arranged in their proportions from below upwards. Of these 347 deaths took place in basements, ground floors, and mezzanini. The other deaths, amounting to 252, took place on the floors above. In many narrow streets in the poorer localities the first floors are scarcely better ventilated than those below them. The upper floors being nearer the upper air, are less objectionable in this respect. The table shows that 115 deaths out of 599 took place in floors above the first floor. The number of deaths diminished rapidly from below upwards, following in this respect the law observed in the plague of 1813, in regard to which it was a saying of the time that "plague was a disease which seldom went upstairs."

We have here, then, certain apparent laws influencing the mortality from epidemic diseases in different districts and in different floors of houses in Valletta, and we have the means of showing that the same laws influenced the course of plague in 1813.

In an interesting account of that severe epidemic drawn up by the late Deputy Inspector General, Dr. Burrell, for the General Board of Health, there is a map prepared by the Works Department at Valletta, showing the houses where plague deaths occurred. The dwellings and floors are entered on the map in figures showing their numbers; but in order to render the comparison between the districts affected with plague and cholera more easy to the eye, I have had the localities transferred to a tracing of Valletta (Map No. IV.) taken from the same map on which the cholera deaths are entered.

The black dots on the plague map show the affected dwellings, and by comparing these with the black dots showing the deaths from cholera on map No. III., it will be seen how close is the resemblance between the two maps. It is evident that plague and cholera haunted the same localities after an interval of above half a century.

Even the blocks of houses on the highest levels of the town, which as we have seen afforded the apparently exceptional cholera deaths in 1865, afforded an exceptional number of plague deaths in 1813.

When we compare the plague epidemic, as regards the floors attacked by that disease, with the number of deaths from cholera in different floors, we find again a remarkable resemblance in the localities affected by the two epidemics. Excluding the Manderaggio, where the buildings are of very irregular construction,* Dr. Burrell's map gives the following proportions of the different floors attacked by plague in Valletta:—

Ground Floors and Cellars.	Mezzanini.	Houses.	Total Dwellings.
234	137	117	488

It hence appears that out of 488 attacked dwellings, 371, or 77 per cent., were cellars, ground floors, and mezzanini.

The preceding summary shows that out of 277 deaths from cholera in Valletta in 1865 there were 160 deaths, or nearly 60 per cent., in cellars, ground floors, and mezzanini. We have already seen that out of 599 deaths from cholera in all the garrison towns, including Valletta, there were 347 deaths in the same class of dwellings.

The proportion of cholera deaths on different floors of village houses does not admit of comparison with the same element in the cities, on account of the very different construction of village houses, as will be seen by comparing plans, Nos. V. and VIII.

There are few or no inhabited basements in villages, and, except in public streets, houses rarely have more than two floors, viz., a ground floor and first floor. In the majority of village houses I inspected built in two floors families appeared to occupy the first floors; the ground floors were generally devoted to some other purpose

* Manderaggio, which is a populous district of miserable lanes and houses covering the site of the old city of Valletta, yielded 99 deaths from plague in 1813 and 20 deaths from cholera in 1865.

(except where the house consisted only of a ground floor), and basements, where they existed, were used for receiving the filth and refuse of the household, including manure of animals.

If village houses are generally occupied in this manner, that is, if the people in the villages generally sleep on first floors, then the death rate from cholera in the ground floors must have been very great.

Tables XIX. and XX. give the deaths in each floor, and we learn from them that out of a total mortality of 771 in villages in Malta, there were no fewer than 429 deaths on ground floors, while on first floors there were 298 deaths. Mezzanini, which exist in a few houses in streets, gave 26 deaths. There were five deaths on second floors, and one death on a third floor in houses of similar construction. Two deaths took place among people sleeping on open terraces above the houses, there were other two deaths in open fields, and the precise locality of 13 deaths is not stated in the returns.

The following are the corresponding facts as regards Gozo.

One death took place in a basement; there were 49 deaths in ground floor rooms, 177 deaths on first floors, and one death on a second floor; one death took place on a terrace, and the localities of two deaths are not given in the tables.

By grouping together statistical facts of the same kind we obtain the following proportions of deaths occurring on different floors in all houses in the islands in which there were fatal cases of cholera:—

	Number of Deaths among the Population living in							
	Basements.	Ground Floors.	Mezzanini.	1st Floors.	2nd Floors.	3rd Floors.	4th Floors.	Terraces.
Garrison towns - - -	15	202	130	137	72	29	6	8
Villages of Malta - - -	—	429	26	298	5	1	—	2
Villages of Gozo - - -	1	49	—	177	1	—	—	1
Total - -	16	670	156	612	78	30	6	11

As already stated, the actual value of the facts in regard to each floor depends on the structure of houses and on the extent of population inhabiting them at the time. But there can, I apprehend, be no doubt that the very great proportion of deaths on lower floors points to some peculiar predisposing conditions connected with these floors.

These statistical facts bearing on the distribution of cholera in 1865 may be resumed as follows:—

1. The death rate for the whole civil population of the islands
   amounted to - - - - - about 13 per 1,000.
   For garrison towns - - - - - 11·7 „
   For villages of Malta - - - - - 12·7 „
   For villages of Gozo - - - - - 16·4 „
2. In garrison towns the death rates were, for Floriana 8 per 1,000; for Senglea, 9; for Valletta and Cospicua, 11; and for Vittoriosa, 18 per 1,000.
3. The death rates in the Maltese villages varied from 2 per 1,000, as at Crendi, Chircop, Melleha, to 12 and 15 per 1,000, as at Zebbug, Zabbar, and Zeitun. The highest death rates were at Axiack, Misida, and Micabiba, where they were 20 and 21 per 1,000.
4. In the island of Gozo the lowest death rate was 2 per 1,000 at Nadur. At Kercem, Xeuchia, and Caccia it was 11, 13, and 15 per 1,000. At Sannat, Zebbug, and Munxar it was 31, 32, and 34 per 1,000, death rates much higher than in any other localities in the island.
5. The death rates in cities, other things being taken into account, bore a certain relation to density of population.
6. The number of deaths, particularly in Valletta, was greatest on the lower levels and slopes.
7. Eighty-two per cent. of all houses throughout the islands in which deaths cholera took place had no more than one death in each; 14 per cent. houses had two deaths in each; 2½ per cent. had three deaths in each about one per cent. of the houses there were more deaths than three

8. About 60 per cent. of cholera deaths in the garrison towns took place on lower floors of houses; throughout the islands by far the greater proportion of deaths occurred on lower floors.
9. So far as relates to Valletta there is statistical evidence to show that the distribution of cholera over the city in 1865 was the same as the distribution of plague in 1813.*

V. Sanitary Condition of Districts and Houses where Cholera prevailed within the Garrison.

The next point in the inquiry is to ascertain whether there was any statistical relation between the sanitary condition of districts or houses, and the proportion of epidemic deaths.

Table XVIII. contains the chief statistical data bearing on this part of the inquiry, but in using them it is necessary to bear in mind that they consist partly of facts, partly of opinions. The facts, I believe, are correctly given, but in cases where I have had an opportunity personally of examining houses in which there had been deaths from cholera I have had reason to dissent almost *in toto* from the sanitary opinions given in the tables. This difference arises from the circumstance that unhealthy conditions, which we in this country have long ago recognized as being among the most powerful predisposing causes of miasmatic diseases, are not considered of so much importance in Malta, apparently because of their almost universal prevalence, or because the influence of such conditions on the course of these diseases has not hitherto attracted attention.

For instance, the tables state that houses are clean and in a good sanitary condition, and not overcrowded, which any officer of health in England would pronounce to be dirty, unwholesome, and crowded. Again, the "water supply" of the majority of houses is stated to be "sufficient," while, in the sense in which we in England use the term "water supply" I saw not a single house of which it could be said that it was supplied at all.

These are, however, matters of local estimate, which will be corrected when the true sanitary condition of the population comes to be better understood. The points of most importance in this part of the inquiry are the facts, and these I shall now proceed to discuss, partly as they are given in the tables, partly from the results of extensive inspections carried out in all the cities and in a number of villages of Malta and Gozo. I made the inspections in company with the Hon. Mr. Inglott, Comptroller of Charitable Institutions, and partly with Dr. Ghio, Police Physician. As it would have been difficult to have conveyed an adequate idea of the state of the houses merely by describing them, the Board of Works at Valletta kindly placed an excellent draughtsman, Mr. Vassallo, at my disposal, to whom I am indebted for the annexed plans, sections, and elevations of types of various classes of affected houses in the cities and villages of both islands.

In our "Report on the Sanitary Condition of the Mediterranean Stations," Capt. Galton and I gave a general sketch of the medical topography of Malta and Gozo. Amongst other points on which we dwelt was the configuration of the islands, especially of the ground occupied by Valletta and the other cities, and the nature of the tertiary sandstone rock forming the porous subsoil of most of the island. We pointed out that this rock underlies the cities, that it is used for building, that it is so porous that liquids saturate it with great facility, so much so that water filters are made of it. We pointed out that all the sewers and drains were formed of it, that they were never flushed, and that the rock became infiltrated with sewage from these sources; we showed that the house drainage was in a condition dangerous to health, that domestic conveniences were most defective and unwholesome; that water brought to the cities was badly distributed; that house tanks for collecting rain water were liable to pollution, and that a better method of water supply was urgently required. We further pointed out the bad general construction of houses and the need of improved dwellings, the construction of which was at the time under consideration. And to the then existing state of the dwellings and to defective sanitary works we attributed much of the peculiar liability of Malta to epidemic and scrofulous diseases, leading to great mortality among all classes and ages of the population

* There can be little doubt that epidemics have generally attacked the population of the islands in conformity with the same general laws of distribution. We know that the seats of fever and small pox are the seats of cholera, and, so far as Valletta is concerned, of plague also. A confirmation of this law was incidentally mentioned during our inquiry at Gozo. The village of Caccia suffered from plague in 1814, the disease having been most severe in certain houses. These same houses were attacked with cholera in 1837, and severely the cholera of 1865. This is the village where a poor patient suffering from plague, who had gone out of house in a state of delirium, was shot by the adjutant of police, and in which another sufferer was found concealing his illness, in the vain hope of arresting an epidemic by taking away the lives of the [illegible] order to prevent contact between sick and healthy.—(Dr. Burrell's Report, page 57.)

The nature of our inquiry in 1861, which was specially connected with the barracks and hospitals, precluded us from making any other than a very general inspection of the dwellings of the civil population, and as I shall presently show by evidence contained in the tables our estimate of the bad sanitary condition of the islands was very much understated.

House construction.—In selecting houses for inspection during the present inquiry we were guided by the cholera death returns. We took houses of all classes, and those of which plans were made may be considered as average representatives of affected dwellings, except the house on Plan VI., out of which came six fatal cases of cholera. This house was pointed out as an example of healthy house construction showing the largest death rate in Valletta, and this was the reason why it was selected as an illustration.

The house in question is of recent construction and has a good elevation; it is 82 feet high; the street in which it stands is only 17 feet wide, and the front is close to the Manderaggio, the chief epidemic district of Valletta. Behind the house is a courtyard ten feet wide enclosed by dead walls and by the back of the house, forming a species of well 75 feet in depth. Within the house, on the landings of the staircase, are two Maltese privies in small dark unventilated closets, the odours from which were most offensive and sickening at the time we were in the house. There were the usual objectionable arrangements for retaining the refuse of the house inside. It need scarcely be pointed out that the two fatal defects of houses of this class, especially if epidemic diseases prevail, are foul air generated by bad drainage and bad cleansing arrangements and the absence of means of thorough draft. On Plan V. are shown two houses of older construction, in a street on the opposite side of Valletta, selected as types of a number of others. The plan shows that these houses are embedded in a mass of building, and are reached from the street by two narrow dark passages 55 feet in length. At the inner end of the passages are two small courts; the largest is only 23 feet by 14 feet. The only opening besides the passages by which air can reach the courts is from the top of the houses, 47 feet above the level of the courts. The plan shows that the living rooms are arranged in floors round the courts, and that the only light and air which reach the houses come from the courts. On all other sides there are dead walls. The courts are drained into the large main sewers by untrapped gulleys. These sewers are also connected with the ventilation of the courts and houses by untrapped sinks and privies.

The section shows the usual water supply of houses in Malta. A tank is dug in the porous rock under the house or under the floor of the court. It is coated inside with cement, partly to keep the water in, partly to exclude sewage coming from the rock. The tank is fed by rain water from the roofs and generally also from the aqueduct.

One of the rooms numbered on this plan is called a "manure room," a convenience or inconvenience which so far as I know is peculiar to Malta. We shall see further on to what use this apartment is put in the villages. The manure room in the cities is used for collecting and keeping the domestic filth, except what passes into the sewers, until the police take it away.

The "manure room" is often at the foot of the stair or under it; sometimes it is a separate small room opening out of the court, or it may be a basement under the houses, as is shown in plan. When we inspected this court our attention was directed to a stair leading down to the basement. The stair was concealed under a mass of house refuse, and the people told us that a man lived among it and slept there. We called him up; he scrambled over the filth; he was ill and presented such a spectacle as one must hope never to see again. After he had spoken a few words he went down the way he came. This may be an extreme case, but how can any people expect to escape epidemic diseases who keep decaying organic substances in and under their houses in this way?

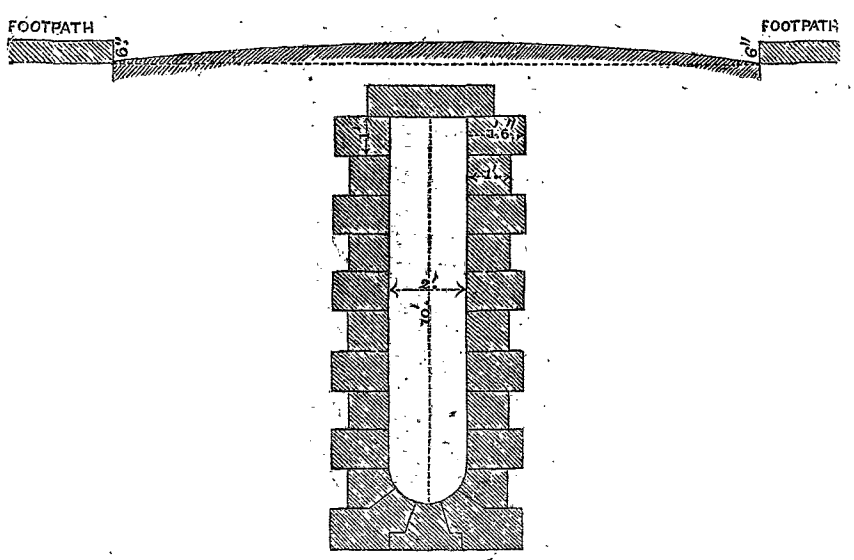
These plans represent the general construction of houses in courts, but there were numerous deaths from cholera in houses entered directly from the public streets. Many houses of this kind are ground floor rooms with a door or window, or both, towards a narrow street consisting of lofty houses on both sides, and having no opening behind. Generally these houses are dark, more or less damp, and they have not sufficient light and ventilation. There were, however, deaths from cholera in apparently better houses of this class, but on closer examination there was generally a privy found inside the house, or some similar well known cause of cholera. With very few exceptions all the rooms visited in the cities were dirty and would have had their sanitary condition materially improved by scraping and limewashing the walls and ceilings.

This was recommended by Capt. Galton and myself in our report already referred to, but house cleansing remains much in the same state it was in when we commenced our inspection at the end of 1861.

This account of the structure and general arrangements of the houses where cholera prevailed will enable the statistical facts, abstracted from Table XVIII., which follow, to be readily understood.

Relation of sewerage to deaths from cholera.— Most of the streets in the garrison are sewered in the following manner:—"The sandstone rock being very soft and easily worked, "it is usual in forming a sewer to dig out a narrow trench 13 or 14 feet in depth. This "when covered over appears to have been the original construction of all the sewers, at "present the sewer is built of sandstone blocks and has a curved invert. The usual "depth of the mains is ten feet, and the width two feet. Into these sewers is received "the rainfall during the rainy season, but none during the warm half of the year. They "also receive refuse water and drainage from privies in houses, &c." *

The following section of a sewer in Valletta will show the construction:—



According to my own personal experience the odour from these sewers is most dangerous if accidentally inhaled. A few hours after such an accident I suffered from severe vomiting, with fever.

Table XVIII. shows that out of 620 deaths from cholera all except half-a-dozen took place in streets and places drained in this way. But nearly all streets are drained. The figures only show that the drainage, such as it is, does no good, and probably does much mischief.

Influence of house drainage.—The effect of bad sewerage must be considered at the same time as that of its concomitant evil, bad house drainage. House drainage remains in the same condition as it was when discussed in the former report already referred to. It was there described as being "of a very bad kind. There are no proper waterclosets. "In the better class of houses the substitutes for them are sloping troughs of the "ordinary porous stone, with a hole at the lower end covered by a rough valve which "can be lifted up by a wooden handle. Water is either supplied directly by hand or "by means of a pipe from a water vessel filled by hand. The arrangement is of a very "rude description, and the stone being porous becomes speedily saturated with filth, and "is hence a constant nuisance. It is not self-cleansing like the ordinary soil pan.

"In the poorer neighbourhoods there is a sink of the most abominable and unwhole-"some description, generally situated in a small court close to the doors. This sink is "the depository of all the filth of the houses, which is carried from each by the inmates "and thrown down. Anything like a proper water supply or trapping is, of course, out "of the question, and the arrangement is nothing but an open cesspool connected with "the town sewerage." †

The privies are generally connected with street sewers by house drains of porous stone, the sides of which become saturated with filth, which is thus transmitted to the surrounding subsoil, or possibly to water tanks. It is no unusual circumstance to see this infiltrated matter making its way through the outer walls of houses; and a careful inspection might discover a similar dangerous nuisance inside very many dwellings where it is least suspected.

* "Report on the Sanitary Condition of the Mediterranean Stations," p. 91.
† Ibid., p. 93.

During the epidemic of 1865 there were 578 deaths from cholera in houses drained in this fashion, and there were 22 deaths in undrained houses. The condition of the drainage in houses where there were 20 deaths is not stated.

Privy accommodation.—A comparison between the deaths from cholera and the privy accommodation gives the following results:—

There were 15 deaths in houses with no privy;
There were 48 deaths in houses having privies untrapped;
There were 20 deaths where the privies were trapped;
Fifty-one deaths took place in houses with both privies and sinks;
And there were 455 deaths in houses where the privy accommodation consisted of open untrapped sinks connected with the sewers and used in the manner described above.

There were four deaths in houses with cesspits, which are uncommon arrangements within the garrison.

The facts are not stated in reference to houses where there were 27 deaths.

Out of the entire mortality within the garrison (namely, 620 deaths) 570 took place in houses where the only means of cleansing the sinks and privies consisted in throwing down water by hand.

There were only two deaths in houses where the privies were supplied with water by pipes, an arrangement confined to houses of a better class.

At the time cholera prevailed nuisance from these privies and sinks was experienced in houses where 468 persons died of the epidemic.

Surface drainage.—The influence of various kinds of surface drainage and paving was frequently brought under discussion during the inquiry. Some of the streets still retain the old hard stone pavement of the time of the knights, others are flagged or covered with close fitted slabs of stone, and many have been macadamized.

It was stated that macadamized streets were not so healthy as others; that they were not so dry, and that houses bordering them were damp after rain, from the rainfall not flowing rapidly off the surface and sinking into subsoil and foundations.

Generally the paving is good, and it is being further improved; but the gulley grates are often untrapped and offensive. These grates in streets and courts gave rise to nuisance in places where there were 300 deaths from cholera.

Water supply.—Reference has already been made generally to the manner in which the population is supplied with water. The supply consists of three parts; 1, the source and amount of supply; 2, the means of storage; 3, the means of distribution.

An account of the water supply is given in the "Report on the Sanitary Condition of the Mediterranean Stations" already referred to. It is there shown that the chief permanent sources of supply are springs on the Bingemma hills, which are conveyed to Valletta by the Wignancourt aqueduct, and certain other springs conveyed to the Cotonera side of the garrison by the Fauara aqueduct. Recently a further supply from a similar source has been obtained, besides a well which has been sunk at the Marsa, from which water is raised by a small steam engine into a tank for supplying the shipping, &c. at the upper end of the great harbour. The total available water supply from the Bingemma during the dry season in 1861 was 537,000 gallons a day, of which 327,000 were distributed at Valletta and Floriana for public fountains, quarters, barracks, hospitals, private tanks, &c.

The Fauara aqueduct yielded 92,000 gallons a day.

The rainfall on roofs is also an important source of supply.

The means of storage consists, as already described, of tanks dug in the soft sandstone rock cemented inside. Of these 122, with a capacity of 30 millions of gallons, were public tanks. In public institutions, barracks, &c. there were 152 tanks with a capacity of 25¾ millions of gallons.

Private houses contained 4,294 tanks capable of containing 323 millions of gallons.

The private tanks are partly supplied from the aqueducts, partly from rain on the roofs, partly from both sources.

Recently there has been considerable anxiety at Malta as to the future available amount of water, on account of drought, which at the time I was in the island had led to the exhaustion of many tanks.

As it appeared to be very necessary to ascertain the chemical constitution of the different water sources, samples from each source were at my request sent to the Laboratory at Woolwich for analysis. In Appendix XXIII. I have given Mr. Abel's report on them, from which the following details are abstracted, showing their constituents in grains per imperial gallon:—

	Wignancourt Aqueduct.		Fauara Aqueduct.	New Well, Marsa.	Aqueduct, Rabato, Gozo.
	Conjoined Sources.	Distribution Tank.			
Carbonate of Lime	11·20	10·50	6·80	21·10	10·03
Nitrate of Lime	0·55	0·45	0·51	1·00	0·45
Sulphate of Lime			1·63		1·46
Carbonate of Magnesia	2·12	2·12	2·80	3·71	6·66
Sulphate of Soda	2·13	1·95		3·47	3·89
Chloride of Sodium	9·34	8·81	9·02	23·88	19·96
Ammonia	minute trace		trace		trace
Organic and other Volatile Matter		0·20	0·50	0·10	0·20

The first three waters in this series are supplied to the cities within the garrison. The Marsa well has been recently sunk to increase the supply, and was not in use during the cholera. The aqueduct water at Rabato in Gozo is used commonly by people there.

The almost total absence of organic matter in all the waters is remarkable. The prominent impurity in all of them is sea salt, proceeding in the higher level waters from spray and possibly from salt in the soils when the springs flow.

The Marsa water is a bad water from its large amount of carbonate of lime and sea salt. The well is sunk in a comparatively low part of the island, at no great distance from the harbours, and its bottom is probably at or below sea level. The underlying rock is soft porous sandstone through which sea water would readily find its way.

The experience of this well shows the necessity in any future works for obtaining water from wells, of not approaching too close to sea level, and of having a careful analysis made of the water before selecting it for use.

There is nothing in any of the garrison waters which should have predisposed the population to cholera. The water of Rabato is somewhat brackish, and is heavy to the taste. It is clear that any dangerous or unwholesome impurities in the garrison aqueduct waters must be added after the water reaches the tanks.

In not a single instance was the water drawn from these tanks at the time of this inquiry fit for cooking or drinking. It was generally discoloured and more or less offensive both to taste and smell. In some cases it was distinctly and strongly impregnated with sewage, in one instance to such an extent that the well had been built up, and the people, fortunately, had to find water elsewhere. Sometimes the neck of the tank was imperfect, and allowed surface impurities to pass into the water. No care appeared to be taken that the vessels used for drawing water were kept clean. So obviously impure and unfit for use were these tank waters that I considered it to be quite unnecessary to send specimens to England for analysis. The quality of the water in tanks will of course vary with the amount of rainfall and the care bestowed on keeping the tanks clean, but if the condition of water in affected houses as I saw it represents in any degree what it was when Malta was threatened with cholera, it would scarcely be necessary to seek for any other predisposing cause of disease than the bad quality of water, arising, not from impure sources, but from a most dangerous method of storing and distribution in the houses. There are no pumps to house tanks in the cholera districts; water is drawn by dipping vessels of various kinds by means of a rope into the tank.

For these and other reasons I cannot by any means concur in opinions expressed in the tables as to good quality and sufficiency of the water supply to houses where deaths from cholera took place.

I shall next state the statistical facts in regard to sources and means of storage, as both, particularly the latter, are important elements in considering the influence of water supply on the course of this disease.

There were 220 deaths in houses with tanks supplied from the aqueducts; there were 194 deaths in houses supplied solely by rainfall on roofs, &c.; and there were 178 deaths in houses where water was obtained from both sources.

The following are the facts in regard to the local position of these tanks:—

In houses where 304 persons died of cholera the tanks were under houses.

They were under courts or entrance where 161 deaths took place, and there were 119 [illegible]ths where there were no water tanks.

[illegible]sides the great risk of impurity from the position of water tanks, they unquestion[illegible]d an element of unhealthiness to the lower floors of houses by diffusion of damp [illegible]d ill-ventilated rooms and other localities.

[illegible] speaking, there is no water distribution in the islands.

In not a single house where a cholera patient died was there such a thing as a water pipe from which water could be drawn for use.

Water was drawn from these underground tanks in the way mentioned in houses where 325 people died, and in 276 houses water had to be carried by hand. It cannot be said that any of these houses had a water supply in the proper acceptation of the term.

Ventilation of houses.—One of the most important facts brought out by the tables is the relation between deaths from cholera and the state of ventilation arising out of the construction of affected houses.

Out of an aggregate mortality of 600 the deaths from cholera in relation to the number of windows in affected houses were as follow:—

There were 336 deaths in houses with one window.

There were 191 deaths in houses with two windows.

Thirty-eight deaths took place in houses with three windows each; eight deaths in houses having four windows; seven deaths in houses with five; and one death in a house with six windows.

There were 19 deaths in houses with no windows.

The tables further indicate what was the position of windows in houses where 584 persons died of cholera. They show that there were 67 deaths only in houses with windows on two sides; while there were no fewer than 517 deaths in houses with windows only on one side, and consequently without through draught.

These statistical results of the inquiry are sufficient to show that in the great majority of affected houses within the garrison there existed at the time cholera prevailed unhealthy conditions of the same nature as those which has been ascertained by experience as sufficient to determine local outbreaks of pestilence whenever epidemics prevail.

They show,—

Defective and bad sewerage.

House drainage of a most unwholesome and dangerous description; domestic conveniences enough of themselves to generate disease.

Bad method of water supply, whether as regards quantity, storage, or means of distribution, resulting in additional dampness to courts and houses, and in the use of unwholesome water for cooking and drinking.

Defective arrangements for removing refuse and filth of houses.

Bad house construction resulting in insufficient light and ventilation; and to these I must add in all the houses I visited,

Want of cleanliness.

Generally bad sanitary condition.

Overcrowding.

VI.—Sanitary Condition of Villages in Malta and Gozo.

The villages (or casals) of both islands, although differing in some external points, such as local position, density of population, elevation above the sea, &c., have certain features in common. Externally their general appearance is not unfavourable. They are mostly clean and respectable looking, and bear evidence of industry and general well-being among the population. The public thoroughfares are well built, and the architecture possesses many points of interest which would repay study on the spot. But behind, and often close to the public streets, are narrow tortuous lanes and cul-de-sacs in which paving and cleansing are by no means so well attended to, and where the house architecture is of a very different character. As already stated, the villages resemble agglomerations of farm buildings, each within its own enclosure. The enclosure is usually numbered as a separate house. The dimensions of the enclosed ground varies in different instances. From 12 to 20 or 30 square yards are not unusual areas. The external walls of enclosures are from 12 to 15, 20, or more feet in height, and have generally a single door from the street. In some cases, besides this outer door, the court may be entered by passing through a room or house, which in its turn has a door opening on the street.

On entering the small courtyard we find various classes of structures built against the outer walls. In some instances all of these are on ground floors, with or without basements. In others there are two floors, the upper one being reached by an outside stair. Sometimes the family occupies the whole or part of both floors; at others only the upper floor. The family accommodation in houses which I inspected generally consisted of one room; in a few instances only of another and smaller inner one. Sometimes part of the room is divided into two floors by a false flooring, also for sleeping. In most cases there are no windows. Light and air are obtained

door opening from the inner court, and there are generally two small loop-holed openings over the door, apparently intended for ventilation. In very few instances are there openings on both sides of the house, and hence there is no through draft. Besides house accommodation, the little yards often contain quarters for animals, cows, calves, horses, mules, asses, besides dogs and fowls, small carts, and the like. One or more animals are common occupants of these places. The village of Casal Curmi is the chief locality in the islands where pigs are reared, and great nuisance arises from them. Sometimes there are a few plants and trees. Weaving is a common female occupation in many village houses, and it is no uncommon arrangement to find one or two rather large wooden looms covering most of the superficial area of the dwelling house. Sometimes there is a corn mill driven by a horse or mule under the sleeping room, or part of the ground floor is used as a common bakery.

The general arrangement of these dwellings will be best understood from the plans and elevations, Plates VII. to XII., and by comparing them with the plans, elevations, and sections of houses in Valletta, given in Nos. V. and VI., the totally distinct character and condition of the population in the villages and cities will be apparent.

As already stated, each of the village enclosures is numbered as a separate house, and may generally be considered as occupied by one family.

My inspection was chiefly confined to houses in which there had been deaths from cholera, and I have no hesitation in stating that I have very seldom met with conditions so obviously injurious to health, and so likely to determine outbreaks of epidemic disease, as those presented by many of these houses. Taken as a whole, I am of opinion that the real sanitary condition of the population of village houses is worse than that of the population of the garrison towns.

Except a partial sewerage, such as it is, of Casal Curmi, Birchircara, and Rabato of Gozo, none of the villages are drained, but at the same time it is questionable whether these villages have really been benefited in health by the kind of drainage which I saw there. For any purpose of health the country population has no drainage.

The small courtyards in every case were badly paved and filthy, often containing considerable quantities of manure and swarming with flies. Where cows or horses were kept there were the usual accompaniments of cow-stalls and stables, viz., manure and other decaying matters. Generally the stable or cow-house is wholly or partially under the dwelling rooms.

There are no privies. In every house I examined there was a "dung room," the usual position of which is shown in the plans.

Generally this room is under part of the house, and has openings through which all the filth of the household and of animals is thrown. Whatever manure can be collected outside the house is usually brought into it and thrown into the "manure room." The mass of filth thus accumulated is allowed to fester in a hot climate under or close to the living rooms until it is removed, perhaps twice a year, and is then either sold or spread on the ground belonging to the householder to increase his crop. An instance or two of the value of the manure may be given.

In one of the small enclosures at Zebbug we saw a woman and four children. Her husband is a blacksmith, who earns about a dollar a week at his trade. The woman herself earns about 5*s.* a month by weaving. Out of this they have to live. Their house rent is 2*l.* a year. There is the usual manure room in this house, into which, besides the filth of the household, as much filth is accumulated as can be collected. About two loads a year are obtained in this way, and its total value was said to be 3*s.* a load. When cholera was in the village two of the inmates of this house were seized, and both died.

The houses in Gozo where cholera first appeared have large dung rooms. The plan of Cilia's house, where two of the earlier cases occurred, with its manure depôt and filthy stagnant drain, over which the family lived, is shown in Plan XII.

The houses attacked in the neighbourhood of Cilia's house have similar nuisances under living rooms. The amount of manure collected in these houses is worth 30*s.* a year or more.

The house where the first cholera case took place in Rabato (Gozo) has unusually large manure storage, and there is a filthy hole, like a badly kept stable, into which the sufferer was carried from the roof of the house where he was attacked.

Plan VIII. shows a house in Casal Zeitun in which there were five cases of cholera. The [illegible] as will be seen, is entirely enclosed among other buildings. It has a cellar "manure [illegible]25 feet long by 8 feet wide, extending under one entire side of the house.

[illegible]II. shows the arrangement of another house in Zeitun, the inmates of which [illegible]erely from fever.

The plan of a village house at Zebbug where two deaths from cholera occurred is given in No. IX. The "dung room" in this instance extends underneath the house on two sides of the courtyard.

The usual position of house tanks and wells is shown on the plans.

With few exceptions the living rooms examined were apparently cleaner inside than those within the garrison, and had not the wretched appearance frequently exhibited by houses in cholera districts, but we scarcely saw a house with a window. Usually air and light are obtained from the doors. Over the doors are small openings, apparently intended for ventilation at night when the doors are shut, but they were generally stuffed up.

One special peculiarity of the ventilation of these village houses requires to be noted.

It has been alleged against the known fact that cholera is most fatal where bad sanitary conditions exist, that as the villages often stand on elevations freely exposed to winds, the houses, from the simplicity of their construction, must necessarily be well ventilated and healthy. This is, however, a mistake. During our inspections the wind in the narrow streets and lanes was often so strong as to render walking somewhat fatiguing, but immediately on entering the small closed yards there was a dead, calm, close, often foetid atmosphere. The form of house construction, originally planned in some remote age for defence rather than for health, certainly acts as a protection against winds, and secures stagnation of foul air within both courts and houses.

These inspections had the disadvantage of having been made at a time when no epidemic disease prevailed, and to show what was the probable condition of village houses when cholera was in them, I shall here introduce an extract from a report respecting Zeitun (a casal which suffered severely both from cholera and from typhus fever which preceded it), made by Inspector-General Dr. Anderson, by order of the Governor, Sir Henry Storks, on October 18th, 1865, when the epidemic was on the decline.

"58, *Strada Botanica*.—Door the only means of ventilation (with the exception of two small apertures above it), and this closed during the night. All excreta thrown into the cellar through two large openings close to the entrance of the principal room. A large collection of manure under cover to the right of the entrance. The cellar, reached by a steep, narrow descent, was at its entrance littered with straw, which we were informed had formed the beds of those unfortunate inmates of the house who had died of cholera. In the cellar we found mud to the depth of two feet, covered at one end with water. The mud was composed of human and animal excreta, &c., and the stench proceeding from it was overpowering. This house had had 10 inhabitants, of which five had died from cholera, and we were informed that this mortality was immediately subsequent to the withdrawal of the water in the cellar by the police; that now collected being from the recent rains. This house is now deserted owing to the alarm the fatal cases of cholera has caused."

"Within the same enclosure is another domicile in which one room is kept tolerably clean, with however only door ventilation; the kitchen, latrine, and a sleeping apartment are in a deplorably filthy state; the stench of the latrine is pestilential. This convenience is a hole excavated in the rock; it is said to be always empty, and this is accounted for (by those who use it) by the fact of the contents oozing through the pores and fissures of the rock. This must necessarily affect the salubrity of a well in the immediate vicinity, the water of which we found partially offensive to both taste and smell."

"No. 21, *Vicolo Molino*.—In this house there is a most disgusting pigsty, serving as a temple of cloacina to an old woman who lives in the room above it. She looks to be upwards of 60 years of age, and she states she is only 38. The floor of the sty was covered to a considerable depth with straw, excrement, water, &c., &c., and inhabiting it was a small pig. One fatal case of cholera had occurred in the room above, and the water in the well had become so bad that the inhabitants of the house had for the time left off drinking it."

"68, *Strada Botanica*.—Is occupied as a cattle pen. Nothing can be worse than its present state, there being deep pools of rain water and urine, with excrements both human and animal. The house next to this lost, out of ten inhabitants, seven from cholera."

"The above-mentioned houses are all situated in Upper Zeitun, but I regret to have to inform your Excellency that we did not find those in lower Zeitun in a better sanitary condition. In one of the lanes was a large vault, with an opening to the roadway, half filled with filth of every description, over which a woman lived whose son, we were informed, was in hospital with cholera. A small fowl house, used as a latrine, had its floor in an abominable state. A house presenting similar conditions had for its inmate a woman recovering from cholera."

Almost all the village houses I had an opportunity of examining, both in Malta and Gozo, could be described in similar terms, but I have preferred making use of Dr. Anderson's report, because it shows what was the state of the houses when cholera was actually in them.

I shall now proceed to show the extent to which similar bad sanitary conditions prevailed in villages.

Sanitary Statistics of Villages.—Statistical forms similar to those issued for collecting facts bearing on the health of the cities were issued for the villages, and the following is an abstract of the results of this portion of the inquiry for Malta and Gozo (Tables XI[illegible] and XX.) together:—

There were 694 deaths in Malta, and 194 in Gozo, making a total mortality of [illegible] streets and places without sewerage.

There were 105 deaths in streets reputed to be sewered in Curmi, Birch[illegible] Misida, besides 37 deaths in Gozo. But none of the places are properly se[illegible]

these deaths, 1,030 in number, took place where there was really no sewerage, properly so called.

The only so-called "house drainage" in villages is merely on the surfaces of courts. There is no provision for removing either foul water or excreta.

As we have already seen, the excreta of men and animals are kept in close proximity to living rooms, so that all the deaths in villages may be said to have taken place in houses where such things as house drainage and house cleansing are unknown, and where the people live among their own filth, treasured up in dung rooms under living rooms, and surrounded by the filth of animals.

Street surfaces in these country villages do not differ much in appearance from the high roads in the vicinity. Except in the public thoroughfares there is not much surface drainage properly so-called, but unless in some close narrow localities it cannot be said that the condition of street surfaces could have exercised much influence on the health of houses in their vicinity.

Water Supply.—The water supply of villages is derived partly from public fountains, partly from roof water collected into underground tanks, and partly from wells in the porous sandstone rock. At the time of this inquiry the tank water had been mostly exhausted during a long drought, and water had to be carried from the fountains. Water tanks appear to be formed in the same manner in the villages as they are in the towns, viz., a circular hole wider below than above, like a bottle, is dug in the rock and cemented inside; into this the roof water is conducted by rough terra cotta pipes, and it is drawn for use by a bucket or other vessel attached to a rope through the neck of the bottle, which rises a foot or two above the level of the court.

Both tanks and wells are generally in dangerous proximity to dung rooms and other nuisances, and most of the water samples I examined bore obvious marks of the presence of organic matter, although not to the same extent as in samples taken from town tanks.

The amount of water at the command of the people is extremely limited, both on account of its source and method of distribution, and to this great deficiency is no doubt to be attributed the want of personal cleanliness in the people, leading to the foul condition of body described in Appendix XIII., as having been found in fever patients admitted from these villages into the Central Hospital, Floriana, just before cholera appeared in them.

The present water sources and methods of obtaining water are most defective, and the quantity of water at the disposal of the people is altogether inadequate for health and cleanliness.

All the cholera deaths in the villages took place in houses where the water supply was open to these objections.

Effect of House Construction.—We have already seen how large a number of deaths from cholera took place in houses within the garrison, where the construction did not admit of free movement of air through rooms. A similar element, predisposing to epidemic attacks, exists in all the villages of Malta and Gozo; the doors and windows generally open only towards the inner courts or yards on account of the peculiar construction of these village houses.

Tables XIX. and XX. show that there were 153 deaths in villages of Malta and 43 deaths in those of Gozo, 196 deaths in all, in houses without windows.

That 448 deaths (359 in Malta and 89 in Gozo) took place in houses with one window only.

That there were 266 deaths (207 in Malta and 59 in Gozo) in houses with two windows.

That 37 deaths (27 in Malta and 10 in Gozo) took place in houses with three windows.

There were altogether six deaths in houses with four windows, and one death in a house with five windows.

The relation of windows and loopholes to through draft across the houses may be estimated from the following data:—

Out of 905 deaths, the data respecting which are given in the tables, there were 690 deaths (546 in Malta and 144 in Gozo) in houses with windows or small loopholes only on one side of the house and a dead wall on the other side.

These facts now adduced in regard to the sanitary state of villages are sufficient to show what are the chief causes of unhealthiness in the village populations.

These I should arrange in the following order:—

1. The absence of sanitary supervision over the yards and houses; the tacit permission accorded to keep animals and to accumulate their litter, together with the filth of the inhabitants, under or in close proximity to living rooms.
2. The peculiar structure of courts and houses, whereby air polluted by exhalations from the above-named sources forms the atmosphere in which people live, and especially in which they sleep.

3. Unwholesome methods of storing water and of drawing it for use. Deficiency of water, and consequent filthy habits of many inhabitants of villages.
4. Absence of all drainage arrangements.

VII.—Cholera in the Public Institutions.

The public institutions of Malta afforded some striking facts and experience in regard to cholera, which it is of importance to put on record, not only on account of their interest, but because they give a general insight into the class of conditions which in Malta are *unfavourable* to the existence of cholera.

There are within the garrison—

1. The Ospizio, an asylum for aged and infirm of both sexes, at Floriana.
2. The Hospital for Incurables at St. Elmo, into which are received diseased inmates of the Ospizio.
3. An Orphan Asylum nearly opposite the Hospital for Incurables.
4. The Central Civil Hospital at Floriana.

About five miles out of town, on the road to Citta Vecchia, is the new lunatic asylum. There is a hospital for sick at Citta Vecchia, besides an asylum for aged (Saura's Hospital), and there is an ospizio and hospital at Rabato of Gozo.

All of these establishments except Saura's Hospital are under the able care and control of the Hon. Mr. Inglott, to whom I am indebted for the facts regarding them.

The Ospizio, Floriana.—The Ospizio at Floriana receives inmates above 60 years of age, and contained about 700 persons at the time cholera was approaching. The buildings were formerly the powder works of the Knights of Malta, and are constructed in successive stages down the slope of the hill from Floriana towards the Quarantine harbour. They consist of long casemated rooms arranged round inner courts like store rooms, with few windows, and having been built for quite another purpose than the accommodation of human beings, the entire structure is most unsuitable for its object. But nevertheless everything possible appears to have been done to remove natural defects and to improve the internal arrangements, and it is really surprising how much has been done in the proper direction, with the limited means at hand, to improve the condition of the inmates. Severe diarrhœa began to show itself in the Ospizio about the middle of June, before there was any cholera in the island. As cholera was known to be in Egypt, great attention was paid to all the sanitary arrangements as soon as this warning came. In order to diminish overcrowding, 300 of the inmates were sent out on allowance to live among the general population, and the dietary of the house was improved. In previous attacks of cholera this establishment always suffered severely. During the epidemic of 1865 there were 30 deaths on an average population of 365, all above 60 years of age. The important practical point is that the largest proportion of deaths took place among aged people living in the rooms furthest down the slope of the hill, a similar fact to the one already mentioned regarding cholera deaths in Valletta. Of the 300 who had been sent out on allowance 15 died. If the death rate in the Ospizio did not reach the dimensions of former epidemic death rates, the fact must be attributed to the enlightened measures adopted to save life; but it was nevertheless much higher than was the death rate among those sent out to live in cholera districts. The reason of this is obvious enough on inspection of the buildings, and it affords a strong argument for erecting the proposed new poorhouse, if indeed any other argument than simple inspection of the present one be necessary.

The bedding and clothes of cholera patients, both in the Ospizio and civil hospital, were all washed in a good well-ventilated wash-house in the Ospizio; a little chloride of lime was used if the linen was very foul, otherwise soaking in water was resorted to. Not a single person engaged in the operation of washing was affected with choleraic disease.

Hospital for Incurables.—The Hospital for Incurables and the Orphan Asylum at St. Elmo are both situated in districts which suffered severely from cholera. The hospital is not a good building, but it is very clean and well kept, and it has the great advantage of having windows opening direct on the sea, so that there is a sweep of sea breeze through it. When cholera appeared in the island there were 240 patients in the building, 34 of whom were sent out on allowance. Every care was bestowed on the wards, and great attention was paid to the sanitary arrangements. Cholera was severe in the immediate vicinity of the wards. There were cases under the very windows, but with the exception of a few trifling cases of diarrhœa the inmates escaped the disease. On the other hand two cases, both fatal, took place among the 34 patients who had gone outside.

Orphan Asylum.—The Orphan Asylum contains 142 inmates, in lofty dormitories, with opposite windows and abundant ventilation. Every attention to the sanitary arrangements of the establishment at the time of the cholera

almost surrounded the building, coming up to its very walls, but not a single case took place within it. Relatives were admitted to see the children on different days of the week instead of altogether, in order to avoid any risk of crowding.

The lesson taught by the experience of this institution is that cleanliness, space, and fresh air put an arrest on cholera.

Civil Hospitals.—The three civil hospitals at Floriana, Citta Vecchia, and Rabato of Gozo are kept in as good a sanitary condition as they admit of. They are old buildings situated in localities where cholera prevailed on account of very obvious local causes. Into these hospitals were received 349 cases of cholera, of which 221 proved fatal. Sixteen patients, most of them old people who were under treatment for other diseases, chiefly chronic and zymotic diseases, were attacked with cholera and 14 died.

Lunatic Asylum.—The lunatic asylum has been recently constructed on a good model. It is a light, cheerful, clean, and well drained, and well ventilated building, situated in a healthy position in the open country. There were 320 inmates in the asylum during the cholera of 1865, and it so happened that a lady who had been living in an infected district of Valletta fled from fear to the house of the medical superintendent of the asylum, which is situated in the main building; she took cholera and died there, but there was no choleraic disease in the asylum either before or after.

Corradino Prison.—Corradino prison also escaped, apparently from strict attention to sanitary precautions. The building is constructed on the usual cellular system; the cells are ventilated and kept clean, and there is no overcrowding. There were deaths from cholera in Casal Paola, close to its outer walls, and during the prevalence of cholera, committals for short periods of imprisonment went on from among the population of affected districts in the garrison day by day as usual, but there was no choleraic disease in the prison.

Although not a public institution, I may mention the experience of model dwelling houses recently erected as regards cholera.

The Camerata.—Next house to the Orphan Asylum at St. Elmo is a very large new block of model dwelling houses called the "Camerata," built by the late Bishop Casolani, partly to let to working people, partly as an example for other builders. There is a spacious inner court open on one side for half its height, and the houses form three sides of the square. Each house has a drained soil pan, and the doors and windows are so arranged that each house has a free sweep of air right through it. Water is obtained from rain collected on the roof and partly from the aqueduct. Cholera existed in most of the neighbouring houses on the slope immediately below this building, and also opposite to it.

There were 280 persons living in the Camerata when cholera appeared, and into it were received four families with their goods and furniture from houses in the town where deaths from cholera had occurred. All the inmates escaped cholera, and I was informed that not a single person in the house had diarrhœa. In this instance, again, personal and household cleanliness, free ventilation, and no overcrowding were the conditions unfavourable to an inroad of cholera.

I have cited these instances of exemption from cholera in order that the conditions under which they took place may be compared with the conditions under which cholera attacked the population of cities and villages, as these have been described above.

VIII.—Sanitary Administration, and Improvements required for Towns and Villages.

Having now given the chief practical results deducible from the experience of cholera in 1865, I shall proceed to consider briefly what are the sanitary works and measures required to diminish this great susceptibility to epidemic diseases in the population of these islands.

The existing sanitary administration of Malta and Gozo is carried out in combination with the ordinary administration of police.

In Appendix XXIV. will be found the public health enactments, contained in the police laws and regulations, and it will be seen that several of the rules in regard to house drainage and water supply, if carried out, would compel the execution of the very class of works in houses to which much of the general unhealthiness and epidemic susceptibility of the inhabitants can be distinctly traced.

The clauses for preventing nuisance and for cleansing houses, &c. are less open to [illegible]eption, but it will be seen that these enactments take it for granted that persons [illegible]d with their execution have some instinctive knowledge of what is nuisance and of [illegible] injurious to health. On the possession of this knowledge the entire efficiency of [illegible]pends. I have not the slightest intention of undervaluing the services rendered [illegible] administered police department in stating that I inspected not a single

house or locality, either in towns or villages, where cholera existed in 1865, in which the presence of nuisances and of conditions injurious to the public health were not evident enough.

It is only just, however, to state that injurious conditions of this class are to be found in much greater intensity in other Mediterranean countries. The public health administration in Malta is much better than it was in former times. Experience of the late epidemic has, however, not only proved that an entire reconstruction of the service is required, but it has thrown much light on the real causes of that high epidemic susceptibility existing among the populations along the Mediterranean seaboard, the main remedy against which has in times past been considered to lie, not in improvements in hygiène, but in quarantine regulations.

The public health improvements required for Malta are of two classes.

First, those for the attainment of which permanent works must be executed.

Second, police administration for preventing nuisance and for enforcing measures of a temporary character required for protecting the public health.

To the first class belong sewerage, house drainage and its adjuncts, water supply, flagging, paving, and surface drainage of courts and streets, opening windows in or ventilation of existing houses and other buildings, oversight of plans of all new houses, arrangement of streets and courts and of general plans of town improvements.

It is quite clear that these duties cannot be undertaken by the police. There must be a distinct authority competent to deal with all structural questions on broad, well ascertained sanitary principles.

In England similar duties are discharged by local boards of health having under them competent surveyors, who are acquainted with sanitary engineering and works, and whose duty it is to see that works are properly planned and carefully executed.

To the same local boards are entrusted all questions of nuisance and all proceedings relating to removable causes of ill health connected with streets, courts, houses, manufactories, trades, slaughter houses, cowsheds, stables, and the like. To aid them in this division of work the boards have competent officers of health and inspectors of nuisances, upon whose reports and evidence proceedings for abatement and prevention of recurrence of nuisances are taken. These proceedings are irrespective of the police force, but the officers of that force would no doubt lend assistance if necessary.

There is no reason, in my opinion, why a similar health organization should not be applicable to Malta and Gozo, at least in its broad general principles.

The first step in administrative improvement is to make it somebody's sole business to protect the public health by removing all causes of disease admitting of removal by sanitary works and measures, and to grant the requisite powers and means.

It is indispensable in Malta that in this matter the Government should take the initiative. There must first be an executive, and then probably three officers would be sufficient to direct the entire machinery of improvement.

1. A surveyor practically acquainted with sanitary engineering, and with the most efficient and economical methods of executing public health works, of water supply, sewerage, drainage, &c., in towns, villages, and houses, and who could aid in the due consideration of improved building plans.

2. An officer of health acquainted with local causes which engender disease, capable of estimating their importance and of giving sound advice to the executive as to how they had best be dealt with.

I was glad to find that this matter had been already under discussion, and that it had been proposed to send to Netley for special training in sanitary work a well educated and otherwise competent Maltese physician and to appoint him officer of health. I would strongly advise that this be done at once. The result would be to give to the executive an adviser on whose knowledge and judgment they might depend.

3. An inspector of nuisances accustomed to deal with inspecting works. Perhaps the best step to take in the first instance would be to appoint a good practical English inspector, and to give him the ordinary duties of an inspector of nuisances under the Public Health Act, with such other duties as local circumstances render necessary.

The sphere of duty of these three officers should include the cities and villages of both islands. They would not only do efficient work at once, but they would originate a better practice than at present exists, and they might train other native officers as assistants and successors.

In order to save expense it might be advisable to connect the police force with sanitary service, at least for the country districts. The police officers know people, and all their houses and habits, and they are moreover on the spot, officer of health and inspector of nuisances could only visit the rural districts

to time. The inspecting officers might also give such instructions to the officers of police as would enable them to do certain inspecting duties with more or less efficiency.

All arrangements respecting the service would of course have to be considered and decided on the spot, and it would be advisable to consolidate and place under one authority all ordinances, rules, &c. having reference to public health questions, such as vaccination, inspection of food, drink, and such like.

The following is an outline of the sanitary works and measures required for the towns within the garrison :—

1. Most of the streets within the garrison are sewered in the manner already described; that is, the sewers are constructed of porous material, without reference to sectional area or inclination; they have no necessary connexion with water supply, and the outlets are all more or less offensive and dangerous to health. In the "Report of the Sanitary Condition of the Mediterranean Stations" general principles for improving the sewerage were laid down. It was there shown that impervious glazed pipe sewers of suitable sections, and carefully laid, should be substituted for the present large porous conduits; that all street and court gratings should be trapped; that the whole system of outlets required to be re-arranged, so as to keep the sewage out of the harbours; and that special arrangements for flushing out and ventilating the main lines of sewers were required.

Experience derived from the late epidemic has confirmed the necessity for the adoption of such measures, and I have therefore to recommend that a survey be made of the cities and that a plan for improving the sewerage on these principles be drawn up for consideration.

Taking into account the value of manure in the island, I would further suggest whether the whole or part of the sewage of the cities might not be advantageously applied by irrigation for agricultural purposes. But in such a climate, and with so thin a covering of soil over the porous rock beneath, care would have to be exercised in selecting localities and in applying the sewerage so as not to injure the public health. A trial of it might very well be made in the first instance on a limited scale. It would be quite worth while to do this, because of the great pecuniary gain which would accrue to the island if the sewage could be utilized in such a way.

2. The water supply requires to be increased, and the existing system of distribution must be completely changed. So long as underground tanks below surfaces of courts and floors of houses are allowed to exist, there can be no security either against damp or against the use of foul water for domestic purposes. There is no reason why the most recent improvements in water distribution should not be applied to every house within the garrison. Looking at the question simply from the side of the public health, I consider this improvement to be imperatively required.

3. The intensity of cholera has been so obviously connected with a bad state of house drainage and want of suitable domestic conveniences, that an entire reconstruction of house drainage is absolutely necessary. After water has been laid on to the houses, and the sewerage has been remodelled, every house should be provided with earthenware soilpans, supplied with water and trapped. The ordinary Maltese latrine which people have been in the habit of using is in some sense an approximation to a healthy domestic arrangement, and there would be no difficulty in substituting a proper soilpan for it. It need scarcely be said that the sinks at present in use for such purposes in many houses, whether in courts or on landings, should be destroyed. The proposed soilpans should be connected with street sewers by glazed earthenware pipes carefully laid, with impervious joints.

4. Every court should be paved in hard stone with as few joints as possible, and the surface drainage should be conducted by an impervious pipe drain from a small trapped gulley in the court to the main sewer. All street gulley grates should be carefully trapped.

5. A strict supervision is required over the sanitary police of courts and lodging houses. Dung rooms and all such contrivances ought to be forthwith abolished. The dry refuse of every house should be removed every day. It should never be lost sight of that every hour of delay in cleansing houses such as are many of those in the cities and villages is an hour of danger to health, especially if epidemics are in the air. House refuse should not be thrown down anywhere in these close confined localities. Carts for removing it should be sent round once every day at the least, and the refuse collected in moveable dust bins or boxes should be carried out and thrown at once into the cart.

House cleansing, scraping, limewashing of walls, ceilings, and the like, requires more attention than has been bestowed upon it. During my inspection of houses where had been deaths from cholera in the cities I scarcely saw a room which was [illegible] cholera were to return, it would find its former habitats ready to receive it.

7. There are houses or parts of houses formerly affected with cholera which are unfit for human habitation. Some have no windows and no light. I had to examine a house of this kind, inhabited by a poor woman and several children, by the light of a lucifer match. Some power is required to deal with such cases and to shut up the houses.

8. Unfortunately a large proportion of houses in the epidemic districts of the cities are of so inferior a character that it is difficult to decide whether they would admit of sufficient improvement to recompense the outlay, or whether it would not be better to incur the cost of rebuilding them on better plans. I examined house after house of this character in street after street, until I almost arrived at the conviction that the most economical and certain way of preventing outbursts of cholera and other pestilential diseases would be simply to destroy these epidemic nests. This measure has answered completely in several places—in Marseilles amongst others—where cholera has been unable to find entrance into healthy houses built on part of its old sites, and has been compelled to confine itself to the bad old houses not yet removed.

The Manderaggio is a district which should be rebuilt entirely. Many houses on the lower levels, especially close to St. Elmo and to the garrison hospital, are of a similar class, and should be dealt with in the same way. What is wanted is a good rebuilding plan of the cities, showing a healthy arrangement of blocks, and also of rooms of houses, allowing a free passage of air from the sea or country through streets, courts, and rooms. There are one or two good recent examples of improvements of this class, but there are others, as at Floriana, in which new blocks of houses have been constructed in such a way as to interfere injuriously with free air currents through adjacent streets. Whether houses be built in streets or courts, the height of the house should always bear a proper proportion to the breadth of the street or court. Mere narrow wells inside blocks of buildings, such as are frequent in the garrison, are sufficient for no purpose of health. Any attempt to save ground by limiting the area required for free circulation of air is sure to defeat itself, that is, if it be intended to construct healthy houses.

Some existing houses where epidemic diseases have occurred among the inmates might possibly be improved by introducing windows or ventilating openings in directions from which air currents could be obtained. The soft character of the building stone enables improvements of this class to be easily and cheaply carried out.

The construction of the Camerata and of some other houses which have been improved on similar principles shows the general outline suited for houses built in courts. There should always be simplicity of construction, admitting of a through draft across the house, and in such a climate care should be taken to isolate waterclosets from living rooms. It is safer to have separate entrances for these from the outer air.

9. It appears necessary to state in regard to all constructive improvements required for health in existing houses, such as improved water distribution, waterclosets, drains, flagging or paving of courts, and the like, that these things, so far as regards the adaptation of houses for healthy habitation, are really parts of the house. Without them the house cannot be considered as complete and fit to live in, and it would hence be no hardship to call on proprietors to complete their houses in these particulars, and to maintain the works in efficiency and repair. These works should either be done by the executive and the cost charged to the proprietor, or by the proprietor at his own cost to the satisfaction of the executive.

Next as regards the villages :—

1. The first great improvements required in village houses are abolishing dung rooms and middens, provision for separating animals from dwelling houses, and a rigid sanitary police; but there are certain local customs which have to be considered in dealing with this matter. Manure is scarce and valuable, and, as already stated, it is collected in village houses both for use and for sale. It is questionable, however, whether epidemics do not sweep off a far greater amount of wealth by destroying households than the entire value of the manure, to which epidemics owe much of their intensity in these villages. Admitting the importance of manure collecting, it is a dangerous and unwholesome trade as at present carried out, and requires to be regulated like any other similar trade; moreover, it is not only dangerous to individual households; it is dangerous to entire neighbourhoods, even to families who do not collect manure. There can, I apprehend, be little doubt that this practice also leads to cultivation of uncleanly household and personal habits.

The simplest way of dealing with the question would be to vest the property of manure in the executive authority, as is done with household refuse in towns und Public Health Act, the authority being responsible for immediate removal of matters. But if this cannot be done, and if the right of property is to be resp it must be exercised under the condition that no manure is to be retained w

at all, but that it must be at once taken to some place appropriated for its reception outside the villages and away from houses altogether.

If it be practicable to prohibit the keeping of animals in small confined courtyards or under village houses, there is no doubt that public stalls or stables away from houses, where horses and cattle could be kept under suitable regulations, would be far safer for the health both of people and animals than the present practice of keeping them in houses, even under regulation.

Unless there be reasons sufficient to justify entailing the inevitable risk of pestilence which must accrue to the people so long as the present practice is continued, it should not be allowed to exist for a day.

Where animals are fed for the market a strict supervision should be kept up over the yards and stalls. The state of many of these is at present most unwholesome and hazardous to the public health.

2. A prohibition against keeping manure in houses would also be a prohibition against keeping domestic filth in houses, and would necessitate a provision of domestic conveniences for the inhabitants. The best way of doing this would be to drain the villages and provide soilpans for houses on the same general principles as for the cities within the garrison. Were this done, the sewage of every village would become an article of considerable value if carefully applied on suitable ground. Until sewerage can be carried out some system of moveable vessels, to be taken away every day, would be apparently the most suitable arrangement.

3. There is no apparent reason why almost every village should not have water laid on to the houses. Generally the villages are arranged with sufficient compactness to render this a work of no great difficulty. The present method of using underground tanks affords a supply altogether incommensurate with the real wants of the people, and the quality can never be depended on. The present supply from public village fountains, if properly stored and distributed, would go some way at least in providing for this want.

4. The surface paving of nearly every court I visited was rough, or broken, or otherwise in bad repair, so that both surface drainage and cleansing were generally in a most inefficient state. The courts of many village houses require to be repaved with hard stone and properly surface drained just as much as some of the courts in Valletta, and this improvement should be enforced.

5. Although the living rooms of village houses are generally in a better condition than those in Valletta, there are apartments in most of the houses which are far from being clean; some of them, indeed, in a noxious and unwholesome state. The sanitary police should see that these places are kept clean, and that nuisance is prevented.

6. Improvements in ventilation of houses by making windows and ventilating openings are almost as much needed in the villages as they are in the cities.

Lastly. There is one sanitary measure urgently required for the inhabitants of epidemic districts both in cities and villages, and that is additional means of personal cleanliness. The people of these houses generally appeared to be little acquainted with the cleansing efficacy of water, and they often looked as if a thorough ablution either of persons, clothes, or houses was a somewhat uncommon event. This has partly arisen, no doubt, from absolute deficiency of water, but it is to be feared also to some extent from bad habits.

The first step towards improvement in this matter is to provide enough of good water, and this can be done without much difficulty. I would venture to suggest whether, after water has been obtained, the establishment of public baths and wash-houses would not be a great boon in all the towns and in most of the villages of both islands. It would also be a great encouragement in acquiring better habits if means of personal cleanliness were provided at all public schools. Any one who desires to see practically what can be done in improving the habits of children in this respect should visit the orphan asylum in Valletta, and he will scarcely fail to remark the striking difference which has been produced in the poor children there by a bath, a few wash-hand basins, and considerate management.

Natural unimpeded action of the skin is, moreover, an important protection against epidemic diseases, especially in southern climates, hence the necessity of careful attention to cleanliness and clothing. Many attacks, both of fever and cholera, have been traced directly to the influence of cold on the surface checking the eliminating and excreting power in a skin already weakened by neglect of its functions. In cholera, the balance of life or death is often determined by the direction taken by the [illegible] process. Every one knows what will probably happen if this process takes [illegible]h the intestinal canal, but few consider to what an extent such a result is [illegible] the failure of action of the skin from want of attention to its condition.

A strong reason for urging forward the various structural improvements required for the garrison towns is afforded by the well known fact that the health of troops is so closely connected with the state of health of the civil population in their vicinity that barracks can never be safe from invasions of epidemic diseases so long as districts, either in town or country, in which barracks happen to be placed are liable to suffer from such diseases.

I now proceed to give the history of cholera in the barracks and hospitals, which will show how much the healthiness of the present defective accommodation for troops must necessarily depend on the degree of purity of the air around them.

IX.—Statistical Distribution of Cholera in Barracks and Married Quarters.

We have already seen that the first case of the Malta epidemic of 1865 took place on June 20th, among married soldiers and their families quartered in the plague hospital, and that the disease continued to manifest itself amongst those of them who were transferred to St. Salvatore counterguard. Ten days afterwards, on the 1st July, the 29th regiment landed at Malta. Part of it was placed in Fort Ricasoli and part at Pembroke camp. Among the men landed at Fort Ricasoli was an old soldier of weakly constitution, who had accompanied the regiment contrary to advice. This man was seized with what was considered to be "cholera biliosa" on the 6th of July and died on the 8th. The rapidity of the termination indicated the case as being one of sporadic cholera. It was the nineteenth case of the epidemic in order of succession, and was the first which occurred in any barrack, except the cases transferred from the plague hospital to the counterguard.

Floriana barrack was attacked on the 13th July, on which date two cases occurred.

Upper St. Elmo yielded a case on the 16th, and on the same day there was a case in the tents of the Horn work outside Floriana.

Lower St. Elmo was attacked on the 18th.

St. James' Cavalier yielded its first case on the 20th in a man of the royal artillery.

A single case occurred in the Couvre Porte barrack, Vittoriosa, among the Maltese Fencible Artillery on the 22nd.

Marsamuscetto barrack and St. John's curtain had each a case on the 26th.

Pembroke camp yielded the first case among men on the 27th July, but there was a previous case in a woman on the 20th July.

Fort St. Salvatore had a case on August 1st.

St. Francesco de Paolo had a case on the 8th August.

Isola Gate barrack was attacked on the 12th.

Fort Lascaris on the 14th and Fort Verdala on the 17th.

Fort Tigne had a single case on September 1st.

There was another solitary case in Fort St. Angelo on November 12th.

Fort St. Angelo was the last barrack attacked during the epidemic of 1865.

Table XXV., Appendix, gives the details of the epidemic in every barrack and corps, and the following abstract shows the occupation of all the barracks in June 1865, together with the total attacks and deaths from diarrhœa and cholera in each. It also gives the attacks and deaths among troops who were removed out of barracks and placed under canvas.

Name of Barrack.	Corps in Occupation, June 1865.	Average Strength.	Diarrhœa.		Cholera.	
			Cases.	Deaths.	Cases.	Deaths.
Upper St. Elmo	R. A.	256	31	—	5	2
Lower St. Elmo	100th Regt.	642	26	—	12	9
Fort Manoel Encampment	Do.	—	48	—	6	5*
Marsamuscetto	R. A.	61	8	—	3	2
St. James Cavalier	R. A.	85	7	—	3	2
Fort Lascaris	R. M. F. Art.	267	44	—	8	4
Floriana Barracks	2/4th Regt.	557	16	3	5	4
Floriana Encampment	Do.	—	44	—	13	9
St. Frances, Floriana	R. E.	153	10	1	—	—
St. Salvatore Counterguard	R. A.	13	—	—	—	—
St. Francis Ravelin	2/8th and R. E.	22	—	—	—	—
Horn Work	2/4th and 100th	31	—	—	4	
Crown Work	100th	21	5	—	—	
Notre Dame Ravelin	2/4th and 2/8th	155	2	—	—	
Fort Manoel	R. A. and 2/8th	344	7	—	—	

* Two of these fatal cases took place in men who went into Lower St. Elmo.

Name of Barrack.	Corps in Occupation, June 1865.	Average Strength.	Diarrhœa.		Cholera.	
			Cases.	Deaths.	Cases.	Deaths.
Fort Tigne	R. A.	62	5	—	2	2
Fort St. Angelo	R. A.	82	6	—	1	—
Fort Ricasoli	R. A. and 29th	601	62	—	6	5
Fort St. Salvatore	Do.	128	12	—	2	2
Vittoriosa Gate	R. A.	5	—	—	—	—
Isola Gate	1/22nd	251	—	—	3	2
Polverista Gate	Do.	225	—	—	3	1
Burmola Curtain	Do.	17	—	—	1	1
San Francesco de Paolo	Do.	153	2	—	3	1
St. John's Bastion	Do.	24	—	—	2	2
Fort Verdala	84th	654	51	—	12	7
St. Clement's	Do.	54	—	—	—	—
Couvre Porte	R. M. F. Art.	53	8	—	1	—
St. Elena Gate	Do.	116	12	—	—	—
Zabbar Gate	29th	85	11	—	—	—
Zeitun Gate	84th	45	—	—	—	—
Pembroke Camp	2/8th and 2/22nd	Varied	65	—	11	9
Tents, St. Salvatore	R. A.	—	—	—	1	—
Vittoriosa Hospitals	84th, 29th, and 1/22nd	—	1	—	7	6
General Hospital	2/8th and 100th	—	2	—	3	3
Forrest Hospital	29th and 2/8th	—	—	—	3	3
Sanitarium, Citta Vecchia	84th	—	—	—	2	2
Plague Hospital	R. A. and 2/8th	—	—	—	1	—

As regards the distribution of cases throughout barracks, we learn, from statistical facts contained in Table XXI., that out of 67 rooms in barracks where cholera broke out there were 56 rooms, or 83 per cent. of the whole, in which there was only one case per room; in nine rooms there were two cases in each, one room yielded three cases, and one four cases.

The influence of different heights of barrack rooms above the level of the ground on liability to cholera cannot be ascertained as most of the rooms are on the ground floor.

Married quarters.—The following table gives the distribution of diarrhœa and cholera among women and children in different classes of married quarters.

Quarters.	Women.					Children.				
	Strength.	Diarrhœa.		Cholera.		Strength.	Diarrhœa.		Cholera.	
		Cases.	Deaths.	Cases.	Deaths.		Cases.	Deaths.	Cases.	Deaths.
Upper St. Elmo	29	1	—	1	—	57	—	—	—	—
Lower St. Elmo	30	2	—	—	—	39	2	1	1	—
Marsamuscetto	3	—	—	—	—	16	—	—	1	1
St. James Cavalier	6	1	—	1	—	6	1	1	—	—
St. Salvatore Counterguard	14	—	—	8	3	29	—	—	1	1
Horn Work	29	6	—	7	5	48	5	2	—	—
Crown Work	21	2	—	1	1	38	—	—	—	—
Notre Dame Ravelin	15	—	—	1	1	27	2	2	—	—
Fort Manoel	5	2	—	—	—	7	1	—	—	—
Fort Ricasoli	63	8	—	6	6	45	27	8	3	3
Burmola Curtain	17	1	—	3	2	31	2	—	—	—
St. John's Bastion	24	2	—	—	—	50	2	—	2	2
Fort Verdala	17	2	—	1	1	11	9	1	—	—
Pembroke Camp	80	—	—	4	3	151	4	4	4	4
Notre Dame Bastion	5	—	—	—	—	8	2	2	—	—
St. Nicholas and Polverista Married Quarters.	58	15	—	2	2	74	17	8	2	2
Plague Hospital	—	—	—	2	2	—	1	1	2	2
Zeitun Gate	—	—	—	1	1	—	—	—	2	2

This table is an abstract from Table XXV.

In 31 rooms in these quarters, the particulars of which are given in Table XXII., 29 rooms yielded each a single case of cholera, one room had two, and another room three cases of the disease.

The statistical history of the epidemic in barracks and married quarters leads to the same conclusion as that already demonstrated by the statistical history of the epidemic in the civil population, namely, that cholera attacked the various buildings at different times in time and distance, as if they had been villages; that it radiated from no central

point; that the epidemic in barracks and married quarters was chiefly made up of single attacks taking place one in each affected room, and that cases where more than one attack took place in the same room were exceptional.

X.—Sanitary Condition of Barracks, Hospitals, and Married Quarters at the time Cholera appeared.

I next proceed to give a brief account of the sanitary condition of barracks, hospitals, and married quarters at the period of the epidemic.

(*a.*) *Sanitary Condition of Barracks.*

In our report on the sanitary condition of the Mediterranean stations, after pointing out that the great casemated structures in Malta were never originally intended for permanent occupation as barracks, but for stores and places of refuge during a siege, Capt. Galton and I gave a summary of the condition of these barracks as we found it in 1861, which it may be well to introduce here in order to show what influence the local position and construction of barracks was likely to have exercised on the health of troops when cholera was present in the island.

"Although great improvements have been effected of late years in the sanitary condition of the towns, there is sufficient in the present state of the drainage and in the outlets to occasion impurity of the air in the neighbourhood of some of the barracks.

"With the exception of Lower St. Elmo all the barracks are at a sufficient elevation above the sea to ensure good drainage; but the local position of several of them as regards the surrounding levels is prejudicial to health, especially where the rooms are built against the rock.

"The local position of nearly all the barracks is very disadvantageous to free external ventilation, from the proximity of high walls or other buildings.

"The barracks, except the new Pembroke barracks, are all casemates, and are all built of soft sandstone, which absorbs a large quantity of moisture and under certain conditions gives rise to dampness of the rooms.

"With few exceptions the barrack rooms are deficient in light and ventilation, and many of the rooms are overcrowded, especially as regards the superficial area per bed.

"The barracks are drained, but the drainage is not of a healthy kind on account of deficient water supply, the disproportionate dimension of sewers, and bad porous material of which the sewers have been formed.

"The latrines are constructed of a bad material and give rise to nuisance and impurity of the air around the barracks. They have generally no seats nor divisions, no doors, no water supply except what is carried by hand, and they are generally deficient in light and ventilation. The urinals are bad both as regards construction and material.

"There are ashpits in close confined situations injurious to the purity of the air.

"There is no water laid on for any purpose. All water for ablution, cooking, washing, drinking, and for drainage purposes has to be raised and carried by hand labour. Drinking water is not filtered.

"The means of personal cleanliness are very deficient.

"The cookhouses are with few exceptions deficient in light and ventilation and the cooking apparatus is of an inferior kind.

"There are no proper means of washing soldiers' linen.

"The married quarters are not sufficient for the requirements of the garrison.

"Many of the guard rooms are of an inferior description, overcrowded, and deficient in ventilation.

"The prison and cell accommodation is deficient.

"There are no means of recreation.

"Considered as a whole, excepting the new Pembroke barracks there are no good barracks in Malta. There are several, such as lower St. Elmo, Strada Torre, St. Elena Gate, Isola Gate, and the lower floor of St. Peter's counterguard, which are not suited for human habitation except temporarily, and we would strongly recommend that this view of the subject be taken and as few men as possible barracked in the worst class of buildings.

"Better accommodation and on healthier ground is what is required to preserve the health both of officers and men, and Pembroke barracks afford an excellent precedent, although the accommodation is not all that could be desired in a sanitary point of view.

"Improved barrack accommodation is more required in Malta generally than at any home station.

In 1861, deducting Strada Torre barrack, which was unfit for habitation and has since been abandoned, there was space according to existing regulation (including the Pembroke barrack just completed) for 6,955 men, while in our opinion there was accommodation for no more than 5,014 men.

The actual number of men in barrack rooms of all classes when cholera appeared was 6,446, showing an excess of 1,432 men over the number we considered safe when all the sanitary works were completed. The garrison was thus overcrowded to the extent of 28 per cent. Sanitary defects connected with the sewerage and water supply of the towns were just as we saw them in 1861, and the sanitary improvements we recommended for barracks were only very partially carried out, although the works have been progressed since the last cholera epidemic. The works executed previous to the cholera of [redacted] are given in Appendix XXVI.

During my recent inspection of the barracks and hospitals in Malta I was struck with their generally improved appearance as compared with the aspect presented by the same buildings in 1861. All the sanitary measures then recommended by us have, it is true, not been executed, particularly as regards space and area per man. Much has already been done for the health and comfort of the troops, and existing facilities, such as they are, appeared to be fully appreciated and made use of by the military authorities; but I by no means consider that the fundamental objections against the barracks which were stated in our former report have been removed. This is, indeed, impossible, for these objections refer to plan, construction, and locality.

As already stated, between the date of our report and the time cholera appeared, in June 1865, not much had been done in the way of improvement; and I think it would be safe to take the experience of the epidemic of 1865 rather as an index of the sanitary condition of barracks as we saw them in 1861, than as affording any test of the result of improvements since that time.

I shall now proceed to state briefly the experience derived from cholera, as it occurred in 1865, of each barrack in relation to the works which had been carried out when the disease appeared.

Upper St. Elmo.—Cholera began in Upper St. Elmo on July 16th, nearly a month after the first case in the plague hospital. The average number of men in the rooms and huts of the fort was 256. There were five cases and two deaths from cholera. Two of these cases and one death took place in old wooden huts much exposed to changes of temperature from their construction and position and not suitable for occupation, especially in hot weather and during unhealthy seasons. There were three cases and one death in barrack rooms; two of the cases which recovered were in ground floor rooms. The hut cases were also in ground floor rooms. One case, a fatal one, took place on the first floor. The rooms had been ventilated by shafts and inlets and the windows enlarged and glazed, but the space per man was only $44\frac{3}{4}$ square feet and 493 cubic feet in two of the affected rooms; and it was 535 cubic feet in the other. This last room, where the fatal case occurred, contained 11 men, and the superficial area was $37\frac{1}{4}$ square feet per man. The affected rooms on the ground floor were eight-men rooms. Each room contained two men more than the number we recommended. Hence overcrowding existed to the same extent as it did in 1861.

The only other improvement which had been carried out was in the ablution room, which had been better supplied with water. Three baths and footpans had been introduced, but the objectionable latrines and drainage were apparently the same in 1865 as we found them in 1861.

The medical officer reports that the water, derived from tanks within the fort, was of good quality, and sufficient in quantity.

Lower St. Elmo.—This barrack was occupied by 642 men of the 100th regiment at the time cholera appeared on July 18th. Between this date and the 27th there were 12 cases of cholera, of which no fewer than 11 proved fatal. On July 27th the barrack was vacated, and the troops were encamped on the glacis outside Fort Manoel, in a dry healthy locality exposed to the sea breeze. An immediate arrest was put on the progress of the disease by this measure. The troops were in camp for two and a half months, and there were during this period four cases and three deaths from cholera. When the disease had declined in the island the troops were transferred to Lower St. Elmo. There were a few cases of diarrhœa among the men, but the only case of cholera took place in a married soldier who lived in one of the condemned ground floor casemates. This case recovered.

It unfortunately happened that when the 100th regiment was encamped at Fort Manoel two or three men had to go into Lower St. Elmo on duty. Two of these men, who worked in the armourer's shop, were seized with cholera, one on the 28th and one on the 30th July, and both died. And another, an officer's servant, who slept in the Hotel de Baviere, took cholera on August 10th and died next day.

Lower St. Elmo was never built for a barrack, and cannot by any improvements be made a suitable place for troops to live in. It has repeatedly been condemned because of epidemic diseases among the men. The lowest of the three floors of which the barrack consists had to be struck off the accommodation on account of great unhealthiness, and is now used for day rooms, married quarters, &c. The barrack is in a pit 60 [illegible] deep; the parade ground is close to the sea level; when cholera appeared its [illegible]rous and offensive drainage system was in the same state as in 1861, and [illegible]ed nuisance in all the rooms attacked by the disease. These rooms are 55 feet

and more in depth. They have windows only at one end, and their opposite extremity, 55 feet from the windows, is formed by soft porous rock. There is hence no through draught, and although means have been adopted to obtain some movement of the air by shafts cut in the rock, yet the men had damp stagnant foul air to breathe. There was nuisance from the town sewers in the vicinity, and also from officers' stables within the fort. All the casemates on each floor communicate with each other by open doors in the walls, so that each floor is really one complicated casemated room.

The epidemic experience in regard to Lower St. Elmo may be summed up in a few words. The outbreak was one of excessive severity. It was intensified by very obvious and well known unhealthy conditions. It was arrested by removal of the troops to an airy locality, and by subdivision under tents; and as if to indicate purely local reasons of the outbreak, two or three men whose duties, unfortunately, required them to go into the fort were attacked and died of cholera.

Water for Lower St. Elmo is derived from a large tank filled from the aqueduct. It is said to have been good and clear in quality and sufficient in quantity at the time the epidemic appeared.

This barrack will be further improved when the works recommended by us after our inquiry in 1861 are completed, but it will always be a bad barrack.

Military Prison, Lower St. Elmo.—The structural defects of this prison were stated generally in the Report on the Sanitary Condition of the Mediterranean Stations. They exist now as they did when that report was presented. If it were not that the ventilators in the floor of the corridor are very properly covered, foul air from an adjacent privy would still find entrance by the openings into the cells. Water is raised by a pump in the corridor, and a large grated opening connected with the sewers is provided for running off the drippings of the pump. The nuisance from this is so great that it has to be covered by a wooden lid. I would in the strongest manner urge that immediate instructions be given to fill up the ventilating shafts and sewer, and to provide other means of supplying air. It would be better to have neither pump nor drain within the building; both can easily be dispensed with.

The warder's quarters are as objectionable as the prison cells. They consist of small rooms, one side of which is formed by the rock, with the large water tank of the barrack close to the room walls. The drainage and gulley grate are very bad, and nuisance from them was experienced in the quarters at the time of the cholera. A severe outbreak of the disease took place in the warder's family, and his wife and children all suffered. Both prison and quarters are exposed to the same unhealthy local conditions as Lower St. Elmo barracks.

St. James, Cavalier.—This barrack is embedded in the solid stonework of the Cavalier. It consists of a range of parallel casemates, having a window at each end overlooking the town of Valletta, and communicating with each other at the ends opposite the windows. There is thus only one divided casemated room in which the troops are barracked. There were 85 men, six women, and six children in the casemates before cholera appeared among them. The rooms were not overcrowded, but the structure provides for too many people breathing the same atmosphere for safety during an epidemic. There are side windows in the two end casemates, so that cross ventilation can be obtained; but the ventilation might be further improved by large shafts carried up through the stonework at the ends opposite the windows. The latrine arrangements are imperfect and offensive, and nuisance was experienced at the time of cholera from drains, latrines, and the state of the ditch. The tank water was impure and tasted badly.

The epidemic first showed itself in the Cavalier as diarrhœa, by which one man was attacked on the 4th and another on the 10th July. On the 16th a woman was seized with diarrhœa and recovered, and on the same day a child was attacked, and died of diarrhœa on the 20th. On the same day, the 20th, the first case of cholera took place in a man and proved fatal. On the 25th another man was attacked with cholera and recovered. Next day a woman was attacked and recovered, and on the 30th a man was attacked and died. This was the last case of cholera in the Cavalier.

Marsamuscetto Barrack.—The objections to this barrack are that it is unsuitable both in position and construction. It was originally a store, and consists of two casemates 73 feet in length, with windows at one end only, the opposite end being formed of the soft sandstone rock of the rising ground above. One of the town aqueducts carried through the rock above and behind the rooms and causes damp. There through draft and no sufficient ventilation. The rooms were in the same state in

they were at the time of the previous inspection, except that the number of men had been reduced according to our suggestion. There were 61 men in these barracks at the time of the cholera. In one of the ground floor rooms containing 30 men there were two fatal cases. There was a case which recovered in quarters on the floor above. There was no nuisance complained of at the time, although the latrines had not been improved. Water derived from the aqueduct was good and sufficient in quantity. The experience of cholera in this barrack affords another illustration of the importance of free moving air and subdivision of men during epidemic seasons.

Fort Lascaris.—This work was occupied by 267 men of the Royal Malta Fencible Artillery, among whom there were eight cases of cholera, four of which proved fatal. The sanitary defects in construction, position, and overcrowding in the building were described in the former report. Before cholera appeared Macfarlane's latrines, supplied with water, had been introduced, and the surface drainage of the upper level had been improved. We recommended that the number of men placed in this fort should not exceed 138, or little more than half the number who were in it during the cholera. In rooms giving 407 cubic feet per man there were three cases of cholera, two of which proved fatal; all the other cases except one occurred in rooms giving less than 600 feet per man. Water was obtained from the aqueduct, and was considered to be good in quality and sufficient in amount. In this instance the two injurious elements were overcrowding and want of free movement of the air, together with dampness in certain of the rooms.

Floriana Barracks.—Except that the small rooms under the civil hospital had been ventilated and better lighted, none of the improvements recommended for this barrack had been carried out when cholera appeared, and 557 men of the 2nd battalion 4th regiment were accommodated in rooms with space for only 362. Water was obtained from the aqueduct, and was sufficient in quantity and of good quality. Cholera broke out among the men on July 13th, when the first fatal case occurred. During this and the succeeding ten days there were six cases of cholera, of which five proved fatal, besides one fatal case of diarrhœa, and another case of diarrhœa which passed into cholera and died. There were thus seven deaths within the time. The regiment was then encamped in the neighbourhood, where it remained for the next two months. During this period there were 13 cases of cholera, nine of which proved fatal, but four of the cases and three of the deaths took place within three days of the time of camping out, and were really due to the barrack. Since the cholera this barrack has been much improved. The long casemates have had large end windows introduced, as recommended in our report. These overlook the quarantine harbour, so that there is now a possibility of through draft. The foul surface drain mentioned by us as passing the doors of the barrack rooms has also disappeared. It was stated to me by Inspector General Dr. Anderson that since these improvements were carried out the barracks had been remarkably healthy, affording a striking contrast in this particular to all experience since the casemates were first turned aside from their original purpose of a manufactory to that of a barrack. If Floriana barracks remain healthy it will be for the first time in their history.

St. Francis, Floriana.—This barrack had been very much improved in drainage, ventilation, and internal arrangements before the cholera of 1865. The window space had been enlarged; the number of men had been reduced considerably below the number proposed by us as requisite for health. There were 153 men of the Royal Engineers quartered in the building at the epidemic period. There were ten cases of diarrhœa among them, one of which proved fatal, but no cholera, although there were fatal cases in the city close at hand. The barracks are now in an excellent state, except that improved cooking arrangements have still to be introduced. But the neighbouring district of Floriana requires much improvement in its sanitary condition.

Fort Manoel.—The barracks of Fort Manoel were occupied by 344 men at the time of cholera. The buildings have great advantages as regards external ventilation arising from their elevated open position and exposure to the sea breeze. There was occasional smell from the latrines before the morning cleaning, and the water derived from tanks is stated to have had a bad taste at the time. All the rooms had been ventilated as recommended by us previous to the advent of cholera. The men appear to have been better distributed over the buildings, for although there was no reduction in numbers, the cubic space was improved. It has been already stated that the fort is close to and overlooks the quarantine establishment, which was crowded with inmates from Alexandria, among whom cholera and choleraic disease had broken out. There was, nevertheless, no cholera in Fort Manoel. The troops escaped with seven cases of diarrhœa, none of

which proved fatal. Free moving air and open elevated position appear to have exercised a preservative influence in this case.

Fort Tigne.—There were 62 men of the Royal Artillery quartered in this fort, among whom there occurred two fatal cases of cholera. But one of these was in a man who was taken ill on July 9th, not at Fort Tigne, but at St. Salvatore counterguard at the time cholera was there. The second case, that in the fort, was on September 1st. There were also five cases of diarrhœa in the fort. Although overlooking the sea, the rooms in Fort Tigne are imbedded among the works, and have inferior internal ventilation. Except diminishing the number of men in the fort generally, nothing had been done to improve the rooms. The men in the affected room had little more than 500 cubic feet each. Water is obtained from tanks, and was muddy at the time.

Fort St. Angelo.—There were six cases of diarrhœa and one case of cholera on November 12th, not fatal, among 82 men of the Royal Artillery stationed in the fort. The cholera case took place in a ground floor room giving 542 cubic per man. The only improvement which had been carried out in this barrack was in the drainage outlet. Fort St. Angelo has the advantage of lofty position and exposure to winds.

Fort Ricasoli.—The accommodation in this fort consists of two sets of casemates, one under part of the land defences, the other in smaller casemates formed out of the counterforts of the S.W. wall of the enclosure. The first set are occupied by single men, the second used to be occupied by troops, but are now chiefly appropriated as married quarters, cells, &c.

Besides the single case of cholera already referred to, which died on July 8th, there were two outbreaks of cholera in part of the 29th Regiment at Fort Ricasoli. The earlier began on August 8th and ended on the 26th. The second outbreak began on October 22nd, and lasted ten days. During these two periods there were six cases of cholera among men, five of which proved fatal, besides deaths among women and children.

One case of cholera took place in a man under punishment in the cells, four in barrack rooms, and one in a married quarter.

When cholera appeared in the larger casemates the space per man was 40 superficial feet, and 616 cubic feet. The superficial area was hence little more than one half of that necessary for health. The construction of the casemates is unfavourable to health. They contain too many men, the window space is too limited and not suitably placed. Improvements in drainage, water supply, and ventilation had been carried out before the disease showed itself. But no improvement could remove the objections arising out of overcrowding and defective construction.

Fort St. Salvatore.—There was a single fatal case of cholera in this fort, and another fatal case in a man in the adjacent married quarters.

The ventilation of the rooms had been improved, and also the water supply, drainage, and latrines. There were 128 men in the barrack rooms. The single fatal case occurred in a room (1. A) where there were 56 men at 600 cubic feet per man.

Isola Gate Barrack.—This very inferior barrack was occupied by 251 men of the 1st battalion 22nd regiment, among whom there took place three cases of cholera, two of which proved fatal. Before the epidemic appeared something had been done to improve the light and ventilation, but in as far as regards health, the barrack still remains essentially what it was. The comparative immunity of the men from cholera was due apparently to the fact that whenever a case occurred, the place was vacated and the troops were camped out.

Polverista Gate Barrack.—This barrack consists of a range of casemates constructed along the top of a lofty curtain, through which Polverista Gate passes. The situation is high and well ventilated externally, but there are doors and windows only at one end of the rooms, and as the end of each room, next the dead wall of the works, is 33 feet from the door there is no through draft. We recommended increased means of ventilation by large shafts and inlets, besides improvements in drainage, latrines, water supply, &c. These had been mostly carried out, but at the time of cholera the ventilation was insufficient, mainly for the reason mentioned; the latrines were not in good working order, and when I was in the barrack there was still nuisance proceeding from them. There were several cases of diarrhœa and three cases of cholera, one of which was fatal, one in each of three casemates, among 225 who were in this barrack. The

improvement required, if it can be carried out, is that a large window should be opened in the end wall of each casemate, so as to ensure perflation of air in the rooms.

San Francesco de Paolo.—Before cholera appeared there were 153 men in this barrack, but they were fortunately camped out. There were three cases of cholera in the barrack, one of which proved fatal, besides three cases of diarrhœa. Nothing had been done to improve this place, which, as stated in our report, "is a defensible work rather than a "barrack, and is not suited for permanent occupation in such a climate."

Fort Verdala.—The construction of this fort has been described in the "Report on the Sanitary Condition of the Mediterranean Stations." The chief sanitary defects in it are ascribed in that report to overcrowding, deficient ventilation, imperfect drainage, and insufficient water supply. Cholera appeared on August 17, and there were during the epidemic 51 cases of diarrhœa, 12 cases of cholera, and seven deaths. In June 1865 there were 654 men in the barrack rooms, a number which was 104 in excess of the number we had proposed to place in them. Nothing had been done to carry out the improvements recommended in the report. The drains were still bad and offensive, the latrines insufficiently flushed, and the men had only 490 cubic feet each in rooms where cholera appeared. Between the 28th August and 12th September about a third of the men were placed under canvas to sleep, and these escaped with one case of cholera, while cases continued to occur in the barracks among men left behind. Some improvement has, I believe, been effected in this barrack since 1865. The greatest of all, after drainage, water supply, and reduction of numbers, would be that of opening an end window opposite the door of each barrack room.

Pembroke Camp.—The accommodation at Pembroke Camp consists partly of a new stone barrack, married quarters, and other accommodation, and partly of wooden huts. The barrack rooms are built in two lines at a sufficient distance from each other. They are all ground floor rooms and resemble successive arches of a bridge in construction, except that instead of being arched above, the roof is laid on horizontal beams. Each room is 30 feet in length from front to back, and there are windows and doors at each end. The beds are arranged seven on each side, with their heads to the dead walls. All these barrack rooms occupy the best and highest portion of the ground and are well exposed to the sea breeze.

The huts are by no means in so good a position, for they are constructed on sloping ground in a valley, across the natural fall of the drainage. The permanent married quarters likewise occupy less favourable ground than the barracks. They are situated at the foot of the slope falling from the barracks to St. George's Bay. Between the barracks and these quarters are large blocks containing schoolrooms, dayrooms, and offices of various kinds. All the buildings are constructed of the porous absorbent sandstone of the island. The drains, partly from the porous character of the stone, are by no means safe, and the first outbreak of cholera was apparently connected with this circumstance.

In June 1865 the camp was occupied by 1,126 men of the second battalion 8th regiment and second battalion 22nd regiment, besides 80 women and 151 children.

On the 5th and 6th July, fourteen days after cholera had broken out at the plague hospital, and a fortnight before the first case showed itself in the camp, the second battalion 22nd regiment marched in perfect health from the camp through Floriana, without approaching any locality where there was cholera, and walked on board the "Orontes" on their way to the Mauritius. The vessel sailed for Gibraltar on the 6th, she arrived on the 10th at Gibraltar without having had any new case of sickness on board, the troops were landed and marched to the north front, and on the 18th a man was seized with cholera of which he died next day. Twelve days afterwards, on the 31st July, another man was seized with cholera and died. The regiment was embarked in two transports for the Mauritius, where it arrived without having had any cholera on board. Sufficient cause is shown, in the report on the Gibraltar epidemic of 1865, for the occurrence of these cases while the regiment was there. Pembroke Camp was afterwards partly occupied by the 29th, 84th, and 100th regiments. Amongst the last of these and in the 29th cholera appeared.

The first case among men occurred on July 27th, and there were altogether 11 cases in men, nine of which proved fatal. Ten cases and eight deaths took place among men occupying barrack rooms, and there was a fatal case in a man living in a married quarter.

The two earliest cases among men were in clerks engaged in the orderly and telegraph room of one of the detached blocks on the slope of the hill. When I saw this place

there were sufficient evidence of percolation of the porous stonework by sewage matter from a porous drain, and to this circumstance was attributed these attacks at the time.

All the barrack cases occurred in five rooms. No. 1 yielded three fatal cases; No. 2 had four cases and three deaths; and Nos. 3, 4, and 12 yielded each a case; the two last rooms had a death each. There was some special susceptibility in the men occupying these rooms, for besides cholera cases all of them yielded a much larger proportion of diarrhœa cases than any others in the barrack. No. 1 room yielded six cases of diarrhœa, No. 2, sixteen cases, No. 3 had eleven, No. 4 had seven, and No. 12 yielded four cases.

The rooms would have been more healthy with fewer men in them, but among local causes I am inclined to attach more importance to nuisance from a latrine in their vicinity, complained of at the time, and to the general unsatisfactory condition of the drainage.

The smaller gate barracks occupied by a few men yielded some cases of diarrhœa and a case or two of cholera. They were much in the same state as when seen by Captain Galton and me in 1861.

(*b.*) *Sanitary State of Military Hospitals.*

So far as can be ascertained from Table XXI., there were 14 indigenous cases of cholera in the military hospitals, no less than 12 of which proved fatal. Of these the bad hospitals in Vittoriosa yielded six cases and five deaths. There were three cases, two fatal, in the General Hospital, Valletta. Three fatal cases took place in the Forrest Hospital at St. Julian's, and two fatal cases in the Sanitarium, Citta Vecchia. In the Report on the Sanitary Condition of the Mediterranean Stations, it had been shown that with the exception of the Sanitarium at Citta Vecchia there was really no good hospital accommodation in the island; and while recommending that certain improvements should be carried out in the existing hospitals, Captain Galton and I advised that two new hospitals should be provided, one for Valetta and another for the Cottonera side of the garrison. We prepared plans of these proposed establishments, but the old hospitals are still in use.

General Hospital.—Appendix XXVI. shows that more had been done to improve the general hospital before cholera appeared than had been accomplished for any other building in the garrison. New windows had been opened, additional ventilation provided, some subsidiary latrine accommodation had been remodelled, but the grave defects in drainage and latrines which we found in the hospitals still existed, and they do so at the present time.

Two of the cases in the General Hospital were in ward orderlies of the 100th regiment, serving in 20 C ward. The first case was in a man who had been attacked with diarrhœa, and was re-admitted for cholera on July 23rd, of which he died next day. The second admission was on August 5th; this man recovered. The ventilation of the ward was complained of as insufficient, and there was nuisance in the ward from foul drains and latrines outside. The third case was on August 7th, in a man of the 2nd battalion 8th regiment, who died the same day.

Vittoriosa Hospitals.—The first case in Upper Vittoriosa Hospital took place on August 17th, the other cases followed on August 27th, 28th, and September 9th and 25th. A fatal case took place in Lower Vittoriosa Hospital on August 17th. Nuisance was complained of in wards where these cases originated from latrines, drains, and vicinity, and the wards were insufficiently ventilated. Both buildings should be abandoned as speedily as possible.

Forrest Hospital.—The cases in this hospital took place on the 21st August and on the 10th and 11th September, all in the same ground floor ward, in which both window space and means of ventilation are deficient. Half the entire height of the ward is above the top of the window, and this is always a bad arrangement, but more especially during epidemics. The hospital is an old private house, and not suitable except as to local position, which is good. There was cholera close at hand, both at Pembroke camp, from which cases had been admitted into the hospital, and also at St. Julian's, where the hospital is situated, at the time these cases occurred in it.

Sanitarium, Citta Vecchia.—Two fatal cases at the Sanitarium, Citta Vecchia, took place on the 2nd and 22nd September in the immediate vicinity of localities in Rab[illegible] and Notabile, where cholera was prevailing at the time, and where it had been very [illegible] for six weeks or two months previously.

Close to the Sanitarium, in a room over the gate at Notabile, the wife of a [illegible]

Army Hospital Corps, who kept herself from all intercourse with the people outside, was attacked with cholera on the 6th August, and died on the same day. On August 11th a child of the corps, living in the tower of Notabile, was attacked and recovered This last case was attributed to nuisance from the Sanitarium cesspit. There was moreover a severe outburst of the disease in Saura's Hospital, at a short distance from the Sanitarium. It began on the 24th August, and continued until the 9th September These indigenous cases in the Sanitarium were at one time supposed to have been caused by the arrival of two convalescents from the garrison; but the attacks in the Sanitarium appear to have been part of this local epidemic. It is certain that they occurred when cholera was committing ravages in the immediate neighbourhood. Deaths from cholera continued to take place among the civil population in the vicinity of the Sanitarium until the 10th October.

In so far as concerns epidemic susceptibility of patients in existing hospitals within the garrison, I fear there is no escape from this contingency. The hospitals are totally unfit for sick. It is satisfactory, however, to know that a new hospital will be shortly provided for the Cottonera side; there is, however, quite as great a necessity for a new hospital in Valletta.

(*c.*) *Sanitary State of Married Quarters.*

Great advances have recently been made in providing married accommodation for the different barracks within the garrison. Most of it has been obtained by remodelling and repairing counterforts in curtains belonging to the defences. Those which I examined are far superior in comfort and conveniences to any which existed at the time of our former inspection in 1861, and no doubt they will be more healthy. Unfortunately they have windows and doors only on one side, and this defect admits of no remedy except the partial one adopted of forming a ventilating shaft in the crown of the arch at the extremity of the room furthest from the door. They have generally an appearance of comfort; some, however, are rather dark, and will be liable to damp in winter from their position, but taking these disadvantages into account, much real improvement has been and is still being effected in providing married quarters, although much still requires to be done before existing necessities are provided for.

There are besides three blocks of altogether new quarters affording excellent accommodation. One is at Pembroke camp, the other in the ravelin outside Floriana. The third is near Polverista gate. These quarters are all constructed on the principle of having doors and windows on opposite sides, so as to ensure a through draught.

A number of barracks have no special married quarters, and families have still to find accommodation either in misappropriated rooms or in old, unhealthy wooden huts.

Upper St. Elmo.—Families in Upper St. Elmo are lodged in small separate rooms in airy exposed situations chiefly on the Cavalier, overlooking the sea on three sides. There were 29 women and 57 children in these rooms at the time of the cholera; there was a single case of cholera, not fatal, in a woman.

Lower St. Elmo.—There were 30 women and 39 children in Lower St. Elmo accommodated in the ground floor of the barrack and in small rooms built against the rock There was a fatal case of diarrhœa in a child, and a case of cholera, not fatal, also in a child.

Suitable married quarters are much required for the troops doing duty at St. Elmo. The existing quarters do not admit of material improvement.

Part of the families belonging to the 100th regiment which occupied this barrack at the time of cholera were lodged in some miserable huts at the Crown work and Horn work, Floriana.

Marsamuscetto.—There were three women and 16 children in the upper rooms of this barrack. One child died of cholera.

St. James Cavalier.—Families are accommodated in the same line of casemates as the single men. The married casemates are divided longitudinally by a low screen. There were six women and six children in this work. One woman had cholera and recovered, but a child died of diarrhœa. The married accommodation has no proper conveniences, and is otherwise unsuitable.

Crown Work, Horn Work, and Notre Dame Ravelin, Floriana.—There are no [illegible] married quarters belonging to Floriana barrack. Families of the 2nd battalion [illegible]ment, which occupied this barrack when cholera appeared, were accommodated

in wooden huts in the Horn work, Floriana, together with families of the 100th regiment stationed at Lower St. Elmo.

In huts of the Horn work there were 29 women and 48 children. The women yielded seven cases of cholera, of which five proved fatal, and there were two fatal cases of diarrhœa among children. They were then tented out at Floriana. A woman and child died directly afterwards of cholera, but the disease was at once arrested.

In the Crown work huts there were 21 women and 38 children of the 100th regiment. One woman died of cholera. The huts are all very old and unfit for permanent occupation. The place looks like a used-up camp. It has no proper drainage; their was nuisance from privies at the time of cholera.

Notre Dame ravelin contains similar accommodation. There were 15 women and 27 children of the 2nd battalion 4th regiment, and 2nd battalion 8th regiment in the huts, besides 155 men. The men escaped with two cases of diarrhœa, but there was a fatal case of cholera in a woman, and two fatal cases of diarrhœa in children.

Fort Manoel.—There are no married quarters in Fort Manoel; there were five women and seven children in the fort at the time of cholera. There were only three cases of diarrhœa among them, all of which recovered, but no cholera.

Fort Ricasoli.—Married quarters have been provided for this fort by improving and appropriating for this purpose a line of small casemates formed out of counterforts of the south-west wall of the fort. They were formerly occupied by troops, and their inmates were frequently attacked with fever. When the 29th regiment arrived in Malta part of the families were placed in these quarters, and on August 14th the first case of cholera took place in them.

As already stated there were two distinct outbreaks of the disease, and from first to last there were eight cases of diarrhœa and six fatal cases of cholera among women; 27 cases of diarrhœa, eight of which proved fatal, in children, and three cases of cholera in children, all fatal. Besides the eight deaths from diarrhœa among children, there were thus 15 cases of cholera, all of which except one, proved fatal. These epidemic outbreaks in Fort Ricasoli were not so much remarkable for the number of cases as for their excessive fatality, and for the virulence of the disease in the small casemates. The same rooms have generally been the chief seats of endemic attacks of fever in the fort. From their peculiarity of construction they have no through draught. There is a dead wall of the works at the end of the casemates opposite the door where windows should be, and this defect cannot be remedied. The rooms are imbedded in the wall, and can never be very healthy. At the time when Captain Galton and I inspected them in 1861 our attention was called to the unhealthy state of the quarters from the occurrence of fever, and we recommended the introduction of special means of ventilation to obtain some movement in the stagnant air of the rooms. These had been carried out, but the movement of the air is insufficient and is not such as can only be obtained by windows. There appears to have been considerable overcrowding in the fort at the time of the cholera. We recommended specially that more superficial area should be given, that all windows should be enlarged, all the casemates ventilated, and the drainage and water supply improved. The commanding Royal Engineer's list, Appendix XXVI., shows that these improvements, excepting enlargement of the windows, had been carried out.

The chief removable defects which existed at the time of the epidemic were hence, overcrowding and insufficient movement of the atmosphere of the rooms. An incidental confirmation of this opinion is afforded by the results of camping out families from the lowest and most unhealthy portion of the married quarters.

They were placed under canvas in wet weather at no great distance from their quarters, and an immediate arrest was put on the disease. Only one case occurred after removal.

In 1866, a year after cholera ceased, families living in these quarters were attacked with endemic fever. In a report on the subject, kindly prepared by Dr. Boileau, he states, "that the haunts of cholera in 1865 were the habitat of fever in the following "autumn."

The most unhealthy of these married quarters are the rooms on the lower level, where there is a sudden drop of the floors of six or seven feet. Part of the back wall of these rooms is formed by the rock, a construction always hazardous to health.

Burmola Curtain.—Improved married quarters have been formed out of the counter[illegible] forts of Burmola curtain. There were 17 women and 31 children in them in June 18[illegible] Three women took cholera and two died. There were two cases of diarrhœa, not[illegible] in children. The quarters overlook a low unhealthy neighbourhood of hous[illegible] there was cholera. Unfortunately the nature of the works prevented access [illegible]

to the rooms from any other quarter, and there was some nuisance from sewers at the time. Otherwise the accommodation is as good as the nature of the locality admits of.

St. John's Bastion.—These married quarters are also in counterforts. They have recently been improved and some were not occupied at the time I saw them. There were 24 women and 50 children in them during the cholera period. Two children died of the epidemic.

Fort Verdala.—Married people residing in Fort Verdala were subject to the same local conditions as the troops in the fort. There were 17 women and 11 children in the fort, one woman died of cholera, and one child of diarrhœa.

Pembroke Camp.—In July 1865 married people were accommodated in two classes of quarters at this camp, namely, wooden huts, and in a block of specially constructed rooms.

The huts are erected on the slope of a valley, and the permanent quarters on sloping ground close to the sea level at St. George's Bay. There were 80 women and 151 children in both classes of quarters before cholera appeared, but the proportion of these occupying huts is not known. The first outbreak of cholera took place in a family living in one of the wooden huts. A child was attached with diarrhœa on July 15th and died on the 19th. The mother was attacked with cholera on the 20th and died on the 28th, and another child of the same family was attacked on the 24th and died on the 29th. There were altogether 11 deaths from cholera and diarrhœa and one case of cholera not fatal in both classes of married quarters. The deaths were distributed as follows:—In wooden huts four children and one woman died of cholera, and two children died of diarrhœa. In rooms in permanent quarters one woman died of cholera, and two children of diarrhœa. The place where another woman died of cholera is not known.

The permanent married quarters thus yielded one cholera death in a woman besides a fatal case already mentioned in a man.

The wooden huts were crowded at the time and some nuisance was complained of from latrines in the vicinity.

The permanent quarters are in two floors with through draft across the rooms. They overlook the bay and have higher ground with lofty buildings immediately behind them. An imperfectly covered drain passed from the quarters and discharged into the bay at a short distance from them, from which nuisance was experienced at the time cholera appeared.

New Married Quarters, Polverista.—This block of married quarters, built across the throat of a bastion, was occupied by families of the 84th regiment at the time of cholera. They are constructed on a good principle in three floors except that the verandah is on the northern side. I have not been able to obtain the exact number of individuals in these quarters at the period of the epidemic. There was one death from cholera in a man living in them. Two women and one child also died of cholera. Eight children died of diarrhœa. A number of these fatal diarrhœa cases were of a protracted character, lasting over several days or even weeks.

So far as can now be ascertained the only probable local circumstance which might have tended to predispose to these attacks was the small amount of accommodation—one rather small room for each family. The civil population nearest these quarters were suffering from cholera at the same time.

XI.—Improved Barrack Accommodation required.

As already stated, considerable advances have been made since the cholera in carrying out improvements in barracks, hospitals, and married quarters, which we recommended; these are still in progress; the late epidemic experience has fully justified the necessity for completing them with as little delay as possible, and especially for giving the fullest effect to our recommendations respecting ventilation and increased space and area for the men.

In every instance the intensity of cholera was greatly influenced by deficient air movement. If any one lesson was more powerfully taught by the epidemic than another, it was that absence of nuisance, subdivision, and free air currents appeared to interpose an almost impassable obstacle to the progress of the disease.

Unfortunately most of the existing barracks, from their local position and construction, [illegible]nder the attainment of these objects all but impossible, at least to the necessary extent. [illegible]r a careful consideration of facts disclosed by the epidemic, I can find no reason for [illegible] the unfavourable estimate given of the barracks and hospitals in our "Report [illegible] Sanitary Condition of the Mediterranean Stations," an estimate which is con- [illegible] report made to the Governor in August 1865, while cholera was progressing,

by Inspector-General Dr. Anderson, in which he says that very few of the barracks "are "from position or construction fitted for habitation for troops in this climate." He further adds, that he is morally certain "that were Government to authorize an outlay "of money in building capacious quarters in healthy sites, the saving in the expenditure "of men from diminished death rate and invaliding, would in a few years more than "compensate for any present disbursement."

Although everything practicable should be done to render existing barracks healthy, I fear there is no escape from the conclusion that the cheapest way in the end would be to allow several of the present barracks to revert to their original uses as stores and refuges during siege, and to provide suitable barrack and hospital accommodation on healthy sites.

XII.—Quarantine Restrictions in reference to Public Health.

In a former part of this report I alluded to the interest which must necessarily attach to restriction of intercourse as a means of protecting the public health, if it be really a fact that cholera can be carried on board ship from affected to healthy ports, and if epidemics themselves are made up of the sum total of cases in which germs of the disease have been transferred directly or indirectly from affected to healthy individuals.

It has already been shown from the simple facts and dates of events that whether cholera was or was not exported from Egypt by ships, it broke out in Malta under circumstances amounting to a proof of its indigenous origin.

I have also alluded to the belief in personal communication of the disease existing among certain influential persons in the islands as an obstacle to sanitary improvements. This belief rests on what is considered to be evidence, and I shall now give in detail some of the cases adduced in proof of the spread of cholera having been, solely or mainly, brought about by personal intercourse, and not by any general epidemic constitution, together with the results arrived at by quarantine after the cessation of cholera in the islands.

In doing this I have no intention of entering into any controversy on the subject of quarantine. My sole object is to place on record corrected statements of these events, as I have been able to obtain them in order that they may be compared with the statistical facts already adduced, so that a decision may be arrived at as to whether the public health of Malta is to be protected in future by sanitary improvements or by restrictions on commerce.

The fundamental fact in the few cases which have been brought under my notice in this inquiry is of the following kind:—

"Such and such a person had been in the house of, or had washed, or handled the clothes of such and such another person who had suffered from cholera, and the visitor or washerwoman had suffered, or had visited, or been in contact with some other person who had suffered."

A natural question which suggests itself is to what extent coincidences of this kind constitute evidence? No doubt, carefully observed coincidences, from which sources of error have been eliminated, may, in one sense, be said to be a basis of knowledge, but just in proportion as they are so, coincidences imperfectly observed have always been fruitful sources of mistake.

The question of how far the communication of epidemic diseases is due to human intercourse, really includes two quite distinct and separate questions. First, there is the question of communicability. Second, whether the fact of communicability (provided it be a fact) can account for the phenomena of epidemics. There is yet a third question, namely, assuming that epidemics are caused by communication, how far it is practicable so to cut off intercourse as to protect the public health from danger?

It is no easy matter to determine the extent to which epidemic diseases are communicable, mainly on account of the numerous causes of disease of another kind which tend to complicate the inquiry. When we are called, on the one hand, to accept and act upon doctrines regarding epidemics, the practical result of which would be to put an end to human intercourse, we are bound to be very sure indeed of our facts. But, on the other hand, there is something truly lamentable in the idea of ships and persons, while engaged in lawful pursuits, being the means of destroying thousands of human beings by merely coming among them, and no one can doubt the propriety of checking human intercourse during epidemic seasons, provided the idea be a true one. It is certainly time that doubt on this point should be settled one way or other, and it can only be done by careful observation than has hitherto been bestowed on it.

In dealing with this subject the first important fact is, that when compar

number of instances in which cholera appeared without even suspected communication, the whole number of alleged cases of communication would scarcely make a fractional difference in the history of the epidemic; and if they were all expunged they would make no difference in the law of progress of the disease, as shown by the statistical facts already given. I shall, however, take the most important and best attested of these cases, and let them speak for themselves.

The first case I shall take is one given me by the Chief Police Physician:—

The steamer "Behera" left Alexandria on June 26, and arrived at Malta on July 1st. There had been one death on board, suspected at Malta to have been cholera, although the captain stated that he did not know the cause of death. The vessel landed 337 passengers at the Lazzaretto, and left the quarantine ground after coaling. Three days after the passengers were landed (viz., on July 4th), three of them took diarrhœa, of which two recovered on the 5th, and one on the 6th July. They received pratique on the 10th.

Of these passengers, a family of four went to Vittoriosa on the evening of the 10th in apparent good health, and slept there. Next morning they went to Corradino to a lodging house, Molo di San Francesco, No. 37. The part of the house to which the people went consists of a number of rooms, each entered from an open balcony facing the Creek. These various apartments were inhabited by different families. The people from the "Behera" occupied a room entered from the western extremity of the balcony, to reach which they had to pass all the other rooms. The room at the opposite or eastern end of the balcony was occupied by a family, a child belonging to which visited the people from Alexandria. We have seen that these people left the Lazzaretto in perfect health. They remained so in this lodging house. They had neither diarrhœa nor cholera. The child was seized with cholera on the 18th, and died. The dates show that the people left Alexandria on the 26th June, *i.e.*, three weeks before they are believed to have given the child the infection, they themselves having continued in perfect health all the time. They passed daily the doors of the other dwellings on the balcony, and no evil result followed to anybody but the child. This fact by itself is presumed to have established the connexion between the disease in Alexandria and the child's case. And then the child, it is said, gave it to others of its family. Its sister was attacked on the 20th, and died on the 21st. A brother was attacked, and died on the 22nd. And another young man who had been in the house took cholera a week after, and died.

Taking for granted that the statements are correct, and that they include all the facts (although many are obviously wanting), we must not forget that the events took place just a month after cholera had broken out in the island, and 9 or 10 days after the first case of cholera had taken place on the same side of the great harbour; besides this the Malta Board of Health had itself certified that the people were in good health.*

The question which may be fairly raised by this case is simply whether persons in perfect health can carry pestilence about them for three weeks, affecting no one out of hundreds they may be daily in contact with in a crowded ship and lazaret, and can then pass the disease over at the end of the time to a young child, without ever having suffered themselves in the slightest degree from it.

I need scarcely say that a conclusion such as this would require a very large number of well observed similar cases, from which sources of error have been carefully eliminated, to justify it, and that a more satisfactory cause of the child's death, as well as of the apparent coincidence, might probably have been found elsewhere.

The next case is one which was supposed to have been very carefully observed, and the facts, so far as they go, are no doubt correct, for I have received them from several sources.

On one of the highest points of Valletta is St. James Cavalier, a huge lofty mass of masonry, rising high above the works and mounting guns on its top. There is a barrack for 136 men, as it were, hollowed out of its interior. The accommodation consists of eight casemates all communicating with each other at one end, as there is no separate passage to give entrance to the rooms. At the time of the cholera of 1865 several soldiers' families were lodged in the casemates, besides unmarried men, and one of the casemates is divided longitudinally by a partial partition to separate the families from each other. The ventilation, such as it is, is common to all the rooms. In one division

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* "The passengers by the steam ship "Behera" from Alexandria having continued to enjoy perfect state[illegible]h up to this date, as stated by the lazzaretto physician, the Board do recommend that they may be [illegible]rom quarantine, this day being the ninth clear day since the "Behera" entered port."—(Board of [illegible]ute, July 10th, 1865.)

of the divided casemate lived a man, named Morgan, and his wife. It is stated that the woman had not been near any affected person or district, only she received into her division of the casemate a child of a woman, Mrs. Gadd, who had died of cholera on July 10th at San Salvatore. The child appeared to be in perfect health. The statement is that the child, Emily Gadd, was attacked with cholera six days after, on the 16th, and died in four days. That on the 26th, about a week after the child's death, the woman was herself taken ill of cholera, and recovered; but that her husband who attended on her took cholera, and died on the 30th. It was, moreover, confidently stated that no case had occurred in the barracks until the child's death, and that, except in the cases arising out of the child's case, there was no cholera in St. James Cavalier.

Such are the reputed facts. Let us now see how far they are borne out by the official returns. Tables XXI. and XXII. give the attacks and deaths from diarrhœa and cholera in St. James Cavalier, and these I have abstracted in the following summary, which shows all the cases in the Cavalier, their dates and results.

Dates.	Name of Patient.	Disease.	Result.
July 4	Francis Monk	Diarrhœa	Recovered.
,, 10	William Rees	Diarrhœa	Recovered.
,, 16	Mrs. Forrester	Diarrhœa	Recovered.
,, 16	Emily Gadd	Diarrhœa	Died, 20th July.
,, 20	George Garment	Cholera	Died, 22nd July.
,, 25	William Bourdell	Cholera	Recovered.
,, 26	Mrs. Morgan	Cholera	Recovered.
,, 26	George Rodber	Diarrhœa	Recovered.
,, 30	William Morgan	Cholera	Died, 30th July.
August 22	James Weakly	Diarrhœa	Recovered.
,, 24	Edward Ives	Diarrhœa	Recovered.
,, 26	John Caple	Diarrhœa	Recovered.
,, 29	W. Tasker	Diarrhœa	Recovered.

It will be seen that these statistical facts give a very different account of the disease in St. James Cavalier. They show, 1st, that diarrhœa had shown itself among the men before the child Emily Gadd was brought into the casemate, and that there were three cases of diarrhœa before the child was taken ill. 2nd. That the child was not affected with cholera but with diarrhœa, of which it died (this might indeed have been inferred from the duration of the case four days). 3rd. The very day the child died of diarrhœa, a soldier named Garment was seized with cholera in another casemate of which he died on the 22nd. On inquiry this man was found to have been an officer's servant. He slept in the Cavalier and attended in his master's house in Floriana. It was stated to me that the officer's wife and servant had had cholera, and that Garment was at the house at the time, and waited on the servant. But the particulars of these cases, their dates, their relation to Garment's case, or even their precise nature, could not be ascertained. Besides, Garment's case was not the only case of cholera in the Cavalier before Mrs. Morgan's, for on the 25th June as shown by the table, a soldier named Bourdell was seized with cholera. This was on the day before that on which Mrs. Morgan was taken ill, and five days before her husband was attacked. I was informed that this man slept in the Cavalier, that he was on picket duty at the gate of Upper St. Elmo, and went from thence to the hospital ill. He is not known to have been near any cholera case. 4th. As already stated, the Morgans lived on one side of a partial partition in one of the casemates. No one in the same casemate and on the other side of the partition was in any way affected; the other cases were in other casemates. Lastly, All these cases in St. James Cavalier took place after cholera had been between three weeks and a month in the garrison, a fact which cannot be ignored, although it still further complicates this and all similar inquiries, inasmuch as the evidence derived from all epidemics shows conclusively that when an epidemic is present among a population, fatal cases continually take place in the absence of communication with affected persons. This outbreak in the Cavalier was obviously a portion of the epidemic.

I shall next give a case or two of alleged propagation of the disease by clothing. One instance of this nature has been already mentioned. A death took place in Strada Mezzodi in Valletta on July 14th. Two washerwomen living at Misida, in a very unwholesome locality, washed the linen of the patient; it is stated that they frequented a house in the neighbourhood of their own house, and that an inmate of the house went to took cholera and died, and finally that the two women died. This is adduced as showing that cholera was carried to Misida in foul linen, and that

apparently in health at the time gave the disease to another person. The following is the chronology of the events :—

Patient in Strada Mezzodi attacked - -	July 14th,	died July	14th.
Washerwomen attacked - - - -	„ 16th,	„	16th.
Their neighbour to whom they are considered to have communicated the disease was attacked -	„ 16th,	„	16th.

These dates alone afford very strong reason for doubting the presumed causation, and the statistics show that while these cases were the first in this village, they were followed by other cases and deaths in other parts of the village on the 17th, 18th, 19th, 20th, 21st, 23rd, and onwards for many weeks. Misida, as will be seen on the maps, lies at the upper end of Misida Creek, close to a shallow stagnant fish-pond, in which fresh water from a sluggish stream close to the houses affected and salt water from the harbour are intermingled. The houses where the cholera cases took place are very bad, and the whole place requires thorough sanitary improvement. With these facts before us, and in absence of any knowledge as to the previous state of health of the women or their neighbour (who may for anything we know have been already suffering from diarrhœa before they got the clothes), should we be justified in ignoring the sanitary condition of the place, the fact that the disease was epidemic in the island, that these three cases were the 50th, 51st, and 52nd in the order of attacks among the civil and military population, and in assuming the fact of sequence as a sufficient proof of causation ?

A somewhat similar class of cases is reported to have taken place in the Fortini at Fort Ricasoli, a set of married soldiers' quarters notoriously subject to epidemic diseases.

In an interesting report prepared by Dr. Boileau, he shows there were two outbreaks of cholera in the quarters in 1865, and an endemic outbreak of fever in 1866.

During the first cholera attack 14 men, women, and children died in the fort, and it is not alleged that there was any communication of the disease at that time.

Two and a half months afterwards, when the epidemic was declining, but when Fort Ricasoli " became more crowded in consequence of companies from Pembroke Camp " arriving," there was another outbreak. The first case was a fatal indigenous one of diarrhœa in a child. A woman who lived at the opposite end of the Fort, but who happened to talk to the child's mother outside the door, in the open air, while the child's body was in the room, was attacked within 24 hours and died.

In another quarter there appear to have been three families. One of the women nursed the woman who died, and is supposed to have got some of her clothes, which she took home. Another woman, whom Dr. Boileau describes as having been "one of the " dirtiest women in the regiment, quite regardless of all but enforced cleanliness and very " much addicted to drinking," is also supposed to have got some of the deceased woman's clothes. The third woman is supposed to have had some clothes belonging to a woman who died during the first outbreak of cholera. Of the three women who are reported to have received clothes, one, the dirty drunken woman, died, and her child died of diarrhœa. The other two had no disease, but the child of one of them and the husband of the other died. Nothing certain is known about these clothes, or what state they were in. There is no direct evidence, only presumption. On the other hand we have positive evidence that there was cholera at the same time in the barracks, that the quarters are unhealthy, that their inmates are at all times liable to epidemic diseases, that they were crowded at the time cholera broke out, that the cases presumed to have arisen from intercourse took place in the same rooms where cholera cases occurred during the first outbreak; and that the disease was arrested as soon as the families were camped out.

The only other cases requiring examination are those of the alleged importation of cholera into Xeuchia in Gozo, and from Xeuchia to Rabato. I have already given Dr. Ghio's account of the facts, and I shall now state certain other facts, most of which he and I obtained in the house where the first case of cholera occurred. But before doing so it may be well to call attention to the state of health of the island before cholera appeared. We have already seen that a change had come over the public health in Malta during the first six months of 1865, and a reference to Table XII. will prove that a similar change had passed over Gozo. During the three years 1859, 60, 61, there had been 172 deaths from gastro-enteritis, a number which, if divided by six, gives 28 as the approximate mortality for half a year. During the half year preceding the cholera in Gozo the mortality from gastro-enteritis was 27; but two other fatal intestinal affections, diarrhœa and dysentery, made their appearance for the first time in this half year. There were deaths from the former, and four deaths from the latter disease, raising the mortality from these affections to 44.

It may enable us further to estimate more correctly the facts as regards Gozo, if we bear in mind, as already stated on Mr. Inglott's authority, that premonitory symptoms commenced to prevail in the Ospizio at Gozo *about the middle of July*, before the alleged date of importation, and that cases of cholera had appeared in Algeria, from 500 to 600 miles west from Malta, before the disease prevailed in Gozo, and that these cases were entirely of local origin.*

The man Cilia who is supposed to have carried the disease from Malta arrived in Gozo on July 21st. ill of diarrhœa and was seized the same evening with symptoms of cholera from which he recovered. But Cilia was not the only person who had arrived from Malta since the outbreak of cholera there. There was no restriction on intercourse between the islands, and numerous boats and persons departed from Gozo, and arrived from Malta.† Nothing was known of their state of health and probably nothing would have been remembered of Cilia's case had it not been from certain events which followed it in the village.

Plan XII. contains a sketch of Cilia's house. On the upper floor are two rooms, one entered from the top of an outside stair, the other is a small inner room.

When the young man became worse he was laid on the floor of the outer room and the house was crowded with neighbours who came to assist. It was stated that as many as 14 or 15 persons were engaged in rubbing the patient, which they did so effectually that he suffered for some time afterwards from the operation.

It was stated that not one of the persons engaged in rubbing the patient suffered subsequently.

There were in the house at this time several members of Cilia's family besides two or three neighbours from adjacent houses, and we shall now see what took place among these persons.

The information was partly given by themselves, partly by the officer of police in charge at the time. It will be seen from the map that Xeuchia is a long straggling village with houses chiefly along the roads, and that the distances are considerable.

Counting Michael Cilia's case, on July 21st, as the first case, there were four cases on the 24th.

One of these, was a woman named Maria Buttigieg, living at a considerable distance from Cilia's house in another branch of the village. She had had no communication with the Cilias. She was sent to the Ospizio at Rabbato. The same day two of Cilia's sisters were taken ill, and were nursed in the small inner room of the house. One died, the other recovered.

The other case was in a woman named Cattarina Attard. This woman had been in Cilia's house. She was attacked, and died at home.

Next day, July 25, a woman named Maria Cassar, whose house was exactly opposite Cilia's, and who had been in Cilia's house was taken ill and died.

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* The facts (Appendix XVII.) regarding the earlier cases of cholera in Algeria in 1865 have been kindly communicated to me by Mr. Churchill, Her Majesty's Consul-General there, in a report presented by M. Perier, principal medical officer to His Excellency the Duc de Magenta, the Governor. M. Perier had done what must always be done under similar circumstances, if we are to arrive at a correct knowledge of epidemic diseases, he had taken steps to keep himself informed of the very first appearance of the disease, and he received the following information on the subject. It is of importance to compare the dates with those of the earliest cases in Gozo :—

1. A Kabyle prisoner coming from Fort Napoleon in the Kabyle country to Dellys, on the sea coast, was seized with symptoms of cholera. He was received into hospital at Dellys, on July 10th, and died on the 11th.

2. A mother and four children arrived by sea from Bona, where there was no cholera, at Dellys, and on the same date, the 10th, one of the children was admitted into hospital with cholera. She recovered. There was no disease at Dellys except a few customary cases of diarrhœal and dysenteric affections. Cholera did not spread in the town.

3. On July 12th a European servant employed by the Kaid of Djelali, in the interior of the country, about 35 miles south of Medea, and 100 miles from Dellys, was brought to the hospital at Medea with cholera, and recovered.

4. A European workman living at L'Arba, who had recovered from fever at Medea, went to Algiers, where there was no cholera, and passed the day of July 23rd. He arrived at Medea, 60 miles S.W. of Algiers on his way home at 5 o'clock p.m. of the 24th. He entered the hospital with cholera at 8 p.m., and died at 2 p.m. of the 25th. M. Perier considers the first of these Medea cases as "une fièvre pernicieuse "algide choleriforme." Similar cases occurred at subsequent dates over a large area of the country for some time before the disease became epidemic.

† A memorandum prepared by the inspector of police at Gozo gives the following approximate number of boats and passengers leaving Gozo for Valletta and Marfa during three months preceding the date of Cilia's return to Gozo. The numbers indicate a corresponding number of arrivals in Gozo.

	Number of Boats.	Number of Passengers.
From 1st to 31st May, 1865 -	217	775
„ 1st to 30th June, „ -	210	750
„ 1st to 21st July, „ -	147	525

On the same day, Orsola Farrugia was attacked in a house not far from Cilia's; but without any communication. She was sent to the hospital at Rabbato, and recovered.

On July 26, Cattarina Saliba, living at a considerable distance from any other case, and without any communication, was attacked with cholera.

Next day, the 27th, Salvatore Xuereb was attacked, also at a considerable distance from any other cases, and without communication. He died in hospital.

On the 28th, Giovanna Mizzi was attacked and died in her house at a considerable distance from any other case and without communication.

On the same day an aunt of Cilia's, Maria Mercieca, who lived near Cilia's house and came to it, was attacked and died.

On the 29th, Carlo Attard, brother-in-law to Cattarina Attard, living behind Merciera's house, was attacked and sent to hospital.

On the 30th, Giovanna Xuereb, living at a considerable distance from any other cases and without communication, was attacked and died. This woman's sister, living in the same house, was attacked next day, the 31st.

And on the same day, the 31st July, a woman, Maria Spitere, was attacked at a considerable distance from other cases and died in hospital; and a man, Antonio Rugeja, was attacked far away from the others and without any communication. This case recovered.

The next case was at Rabato.

These 16 earlier cases in Gozo I believe give a faithful account of the facts, and whatever importance may be attached to personal communication or proximity as media of the spread of cholera, the fact cannot be doubted that out of four simultaneous cases which constituted the first outbreak of the disease, one took place a long way from the house supposed to have been the focus and without any communication, and that one-half of the 16 cases had no communication with Cilia's case, or with any other.

Several of the cholera cases which occurred at Xeuchia were taken to the Ospizio at Rabato, about a mile distant, for treatment, and because cholera subsequently appeared at Rabato it has been averred that the disease was really imported from Xeuchia. After examining the facts regarding the disease at Xeuchia we went to Rabato and visited the houses where the five earlier cases of cholera took place.

The first case was in a boy whom we saw. Before his attack he had been sleeping on the roof of a house about a quarter of a mile from the Ospizio where there were three or four cholera cases under treatment. No part of the Ospizio could be seen from any part of the house. The boy was taken ill at 2 a.m. on August 3rd, and had no communication with any place where cholera was.

The second and third cases took place in a husband and wife who lived mid-way between the house of the last case and the Ospizio. But the husband was taken ill on board his boat at Marsalforn bay, 1½ miles from Rabato, at half-past 7 p.m. on August 4th. He died. The following morning, August 5th, the wife was taken ill, and recovered. On August 4th, another case took place in a small detached cottage at about 600 yards from the Ospizio, and a long way from the preceding cases. This case had no communication with any other.

The next case took place in a woman living quite at the outskirts of the town without any communication with any other cases.

It appeared to us that the examination into these cases was sufficient to disprove the assertion that cholera had been imported into Rabato, and we did not consider it necessary to carry the inquiry further.

Mr. Inglott's Report, already referred to, shows besides that fatal diarrhœa cases had begun to appear in the Ospizio two days before the outbreak of cholera at Xeuchia. All the houses we visited where these cases had taken place were in a wretched sanitary condition. The people at Xeuchia live over dunghills.

None of the supposed importation cases either prove or disprove the communicability of cholera by personal intercourse, but unquestionably, in so far as they enter into the history of the epidemic, they do not support the presumption that the epidemic was due to personal communication.

In estimating the value of such facts we must bear in mind that during the course of the epidemic there were multitudes of instances of persons going from affected to unaffected districts without even a suspicion having been raised of their having carried cholera about with them. Intercourse throughout the islands went on as usual, and without apparent injury to the public health. The few exceptional instances in which endeavours were made to trace the spread of the disease to communication have resulted in obtaining such evidence as I have just given. Nor must we forget well attested cases where every popularly required condition for spreading the disease existed without any such event following.

The table already given of the attacks in villages in Malta shows that a solitary case of cholera occurred in the village of Dingli. This village is extremely filthy. The striking points about it are that it has only a small population and stands on an

elevated site. The people appear never to have taken any steps towards improving their sanitary state. The fatal cholera case in the table was an imported one. There were favouring conditions and personal communication, but something else was wanting, for nobody in the village took the disease.

The very first case among the civil population of Malta was, as we have seen, that of a man who went from the plague hospital, where cholera existed, to Attard where he took cholera and died. In this instance there could be no doubt of intercourse under favouring conditions, but no evil result followed.

Other cases of marked immunity from cholera after intercourse with affected persons have already been mentioned in connexion with the public institutions, in which the reasons for exemption were more apparent than in the Attard and Dingli cases.

The striking evidence afforded by statistics already referred to, showing the distribution of cholera mortality throughout the islands, points to some law of propagation of cholera quite apart from communication, mediate or immediate. We have seen that 82 per cent. of all houses where there were deaths from cholera yielded only a single death per house, that 60 per cent. of the deaths took place in lower floors of houses, and that in Valletta the law of distribution of cholera in 1865 was the same as the law of distribution of plague in 1813. We have seen besides how marked has been the statistical relation of death from cholera to the condition of dwellings, and the striking immunity from disease which was apparent wherever there was cleanliness and a free moving atmosphere of pure air in and about dwellings.

During this inquiry an objection by no means new was raised against the fact of bad sanitary condition being a predisposing cause of cholera, viz., that the disease had frequently passed over houses in a bad sanitary state without touching their inmates. This is no doubt true, but the important practical point which has been established anew at Malta during the epidemic of 1865 is, that while cholera attacked people living under obviously unhealthy conditions, it did not attack dwellings where the same unhealthy conditions were absent.

When these facts, which are facts and not opinions, are compared with the evidence adduced in favour of a hypothetical agent passing mediately or immediately from affected to unaffected persons and districts, and leaving death in passing, we can surely have no difficulty in selecting a basis on which to erect a superstructure of improved public health. We have besides experience to guide us. We know by what measures the epidemic susceptibility of a population can be reduced or removed, and we know also that interruption of human intercourse to an extent required by any germ hypothesis (and nothing short of absolute interruption can on this hypothesis fulfil the requirements of reason), is simply an impossibility.

There are abundant instances of cholera having been mitigated or arrested by no very difficult or costly methods, but among these methods the obstruction of human intercourse has certainly not been one.

Interruption of intercourse has been long in use, and nevertheless cholera and other epidemic diseases have followed their appointed march. Quarantine did not arrest the progress of cholera over Europe in 1865.

And when we examine what has been the result of the various quarantines enforced since cholera declined in Malta, the question may fairly be asked whether the loss to commerce has not vastly exceeded any hypothetical gain to health.

In Appendix XXVII. are given three sets of quarantine returns, showing the vessels placed in quarantine after cholera declined at Malta. A number of ships did not ride out their quarantine, but still quarantine was an obstruction to commerce, with results such as the following:—

We learn from the tables that between the 1st of August 1865 and the 31st December 1866 no fewer than 1,008 vessels entered Malta in quarantine. The aggregate tonnage of these vessels was 502,507 tons; their crews amounted to 28,622 men, and they had 1,663 passengers on board. If all the vessels had rode out their quarantine, no less than 1,944,504 tons of shipping would have been detained for a day, and 101,632 men, with 16,734 passengers, would also have been detained for a day.

As the whole of this immense obstruction to commerce took place in ships arriving from affected ports, we should naturally expect that a considerable number of cholera cases would have been found on board or in quarantine, and yet what is the fact?

Two vessels, each with a case of cholera on board, were refused admittance, so that the only vessels which might apparently have justified quarantine were not placed in quarantine, but were sent away. Among the other ships passengers and crews there were a single case of cholera, and there were only eight cases of diarrhœa, all of which, one exception, took place while cholera was in Malta.

Such was the result to the public health obtained by obstructing the commerce of the islands to so great an extent.

The mere pecuniary loss resulting from the practical working of this method of dealing with cholera, while these quarantines were in force, would in all probability have been more than sufficient to have placed every house in the cities in a proper sanitary condition.

The facts of the epidemic of 1865 are, in my opinion, quite sufficient to show that to trust to restrictions on intercourse for keeping pestilence out of Malta, in its present most unhealthy condition, is a costly and fatal mistake; and that the public health must be protected by removing local causes of disease, everywhere visible enough at present.

But unfortunately popular opinion in other countries often renders quarantine compulsory at Malta. At the present time the Mediterranean sea ports, with few exceptions, are in so bad a sanitary state as to be in constant danger of epidemic outbreaks, and, instead of adopting vigorous measures of improvement, the past practice has been to put each other in quarantine when any danger appeared in the distance. Any recusant port would be sure to have its commerce arrested, and hence the authorities in Malta, whatever their convictions may be, are obliged to comply with the requirements of other countries in this respect. There is no remedy for this except the spread of more enlightened views regarding the true nature of epidemics, and unless Governments recognize and act on the principle that the only real safeguard against pestilence is to root out its local causes.*

JOHN SUTHERLAND.

War Office, July 1st, 1867.

* The town of Gibraltar, which is now undergoing efficient sanitary improvement, has been even more unfortunately situated than Malta in respect to enforced quarantines, put on for the purpose of keeping the garrison communications open with their less enlightened neighbours. The fixed population of Gibraltar is about 15,500, almost entirely dependent on commerce for its support. Quarantine against cholera was declared in June 1865, and information received from the Government shows that up to the end of September 1866 no fewer than 634 vessels, amounting to 323,409 tons, were placed in quarantine. Of these vessels 244 were quarantined at the instance of Spain. 240 vessels, with a tonnage of 45,278 tons, rode out their quarantine, and 395 vessels with 278,131 tons sailed in quarantine. The loss arising from these proceedings must have been very great for so small a community. So far as concerns public health, the practical result was that not a single case of cholera appeared on board these vessels, and yet that Gibraltar was visited by one of the most severe cholera epidemics on record.

POSTSCRIPT.

Since this report was in type, I have received two documents of great interest in their bearing on the question of whether the protection of a community from cholera should rest on restrictions on commerce, or on measures of hygiène.

The first is an account by Dr. Ghio, chief police physician, of a re-appearance of cholera in Malta, in spite of quarantine against countries where the disease existed.

The second is an extract from a communication from R. S. Ellis, Esq., president of the Madras Sanitary Commission, relating to measures which have been successfully used to arrest the development of cholera in India. I have alluded to this experience in a previous part of the report.

On July 17, 1867, Dr. Ghio writes from Malta as follows:—

"You are aware that quarantine has, here, been established for arrivals from places "infected with cholera. There are, consequently, at present in the Lazzaretto 268 "passengers, of whom the greater part came from the Regency of Tunis. One of the "lots, consisting of three families, numbering 30 persons, came in four days from Susa, "on the 16th June last. They have been lodged in four large rooms on the left side "of the 9th division, at the western end of the Lazzaretto. On the 5th instant (19 days "after arrival), one of those passengers, a woman, aged 26 years, was at half-past 11 a.m. "seized with cholera, and died of it on the 6th, at three-quarters past 4 a.m., on which "day (the 6th), at 2 o'clock p.m., another case followed in another woman, aged 42 "years, belonging to the same lot, but who was lodged in the fore-room of the division, "and contiguous to the room where the first case took place; she died on the 7th at "three-quarters past 8 a.m.

"Those passengers informed me that the deaths from cholera at Susa, when they left, "were about ten daily; the disease was in quarters a little distant from their houses; "the corpses were carried to the cemetery by the street, and before the houses where "they (the passengers) lived. They said also that none of their families had the disease, "nor any of them had frequented infected houses.

"It is, further, important to be noticed that all the soiled clothes and linen of those "passengers were, from the very day in which they landed at the Lazzaretto, put several "times into water, and afterwards ventilated, and that till the day previous to the first "attack, all clothes, bedding, &c., were twice regularly fumigated with chlorine in close "rooms, under the supervision of three good health guardians, one of whom, an old and "experienced man, is extremely strict to his duties. The passengers in question did "not, nor could they, communicate with other passengers in quarantine.

"On the 7th inst. a man aged 33 years, the master of the Italian Trabaccolo 'Giaco-"mina,' was attacked with cholera on board his vessel at 12, m., and died at the Lazzaretto "on the 8th, at half-past 7 o'clock p.m. The vessel, laden with barley, had arrived from "Trani on the 24th June last, after nine days' passage, and had already performed 13 "days' quarantine, and was anchored on the side of the Lazzaretto, in front of the old "plague hospital. They say that the sister of that man died of cholera at Trani a few "days before he left.

"On the 10th, another case of cholera took place in a boy, six years old, who, with "other 28 persons had come also from Susa on the 22nd June (18 days before the "attack), and he and the others were lodged in the 1st and 2nd subdivisions of the "old plague hospital, a low building lying a little above the level of the sea, at the "western end of the Lazzaretto, and below the right side of the 9th division. These "passengers were also, since their landing, subjected to the same sanitary measures as "the other passengers. The boy is getting better.

"While these cases of cholera were taking place at the Lazzaretto, other cases of "cholera occurred in other country places of this island. The first case reported took "place at Casal Gargur on the 5th inst., in a man aged 45 years, who with two other "persons were sent from Valletta to the Lazzaretto to take care of cattle, in quarantine, "arrived from Tunis on the 13th June. The man was admitted to pratique on the 4th "instant, and early in the morning conducted the cattle by land to Corradino, where on "arriving, he drank a great quantity of fresh water, and ate some fish. He confessed "that on leaving the Lazzaretto he suffered from a slight diarrhœa.

"On the 9th inst. another case of cholera occurred at Casal Curmi in a woman a[redacted] "30 years.

"On the 11th a woman, aged 36 years, was seized with aggravated sympt[redacted] "cholera at Casal Gargur. She had, the day previous, lost a child in conse[redacted] "suspicious symptoms of cholera.

"On the 12th, finally, at 2 o'clock, a. m. Mr. G. M., aged 75 years, was suddenly " seized with aggravated symptoms of cholera at Casal Zebbug.

"All these persons are in the way of recovery, and no fresh cases have since taken " place either at the Lazzaretto or in the island."

Mr. Ellis' communication, of which the following is an extract, is dated Madras, June 5, 1867:

" The place where the experiment was first tried was at a great Hindu shrine called " Conjeveram, about 40 miles from Madras, and now accessible by railway. Here in " the month of May vast numbers of pilgrims from all parts of India assemble, and prior " to 1864, the assemblage of the pilgrims was always attended by an outbreak of cholera, " which they carried into Madras and along their various lines of march. In 1864, I got " attention directed to the necessity of sanitary precautions. The measures I advised " were simple enough. A regiment of scavengers was enlisted during the time of the " feast. The streets were thoroughly watered and cleansed twice a day.

"The wells used for drinking purposes were carefully guarded, and the greatest care " was taken to prevent any contamination of the water.

"All carts and animals brought by the pilgrims were picketted in proper places " assigned to them, and were not allowed to remain in the streets. Public latrines in " sufficient numbers, and made of bamboos and leaves, were erected, and nuisances in " the streets and highways were entirely prevented. These latrines were constantly " cleaned, and all sweepings and dirt of the town were buried in pits to leeward of the " town and covered with earth. These precautions were observed during the whole " period of the festival, from 10 to 15 days. The result was most successful. The " festival of 1864 passed without any outbreak of cholera. The same arrangements " have been made during the last three years, and with entire success. This has been " done without grumbling, through the influence of the local officers. The residents " who profit by the pilgrimage, and the managers of the temples, have borne a large " share of the expense. What has been done so successfully at Conjeveram in the " Madras district has also been done with almost equal success for the great Humphy " festival in the Bellary district. All that is necessary is to make these sanitary " precautions obligatory by law."

On considering these facts it appears that this new outbreak of cholera in Malta, occurring almost simultaneously in the Lazzaretto and villages, was a portion of an extensive epidemic, covering a large area. Susa is 220 miles west of Malta. Trani is 380 miles north-east of Malta. We know from other sources that cholera was severe and fatal in Sicily at the same time; and persons coming from Susa and Trani were attacked at Malta above three weeks after leaving these ports.

Dr. Ghio shows that on July 5th there were two attacks, one in a Maltese cattle driver, the other in a woman from Susa. Next day, the 6th, another woman from Susa was attacked. On the 7th the man from Trani was seized. On the 9th there was a case at Casal Curmi, two miles from the Lazzaretto. On the 10th a boy from Susa was attacked in the Lazzaretto. On the 11th there was a case at Gargur, three miles away, and next day, the 12th, a case occurred at Zebbug, four miles distant from the quarantine establishment.

I have already described the sanitary condition of the villages and Lazzaretto; and I have shown from the experience of 1865 that they are very likely places for cholera to become developed during epidemic seasons.

In the present instance it is certain that neither quarantine nor disinfection kept cholera out of the villages.

The Indian experience, on the contrary, proves that the immemorial annual outbreak and spread of cholera from Conjeveram has been put a stop to by measures of hygiène alone, without interfering with human intercourse.

J. S.

APPENDIX.

TABLE I.—DEATH RATE of MALTA and GOZO.

Year.	Ratio per Cent. per Annum.	
	Malta.	Gozo.
1864 - - -	2·7	2·3
1865 - - -	4·7	4·6
1866 - - -	2·5	2·3

The above per-centage is reckoned on population as per census of 1861:—

Malta - - - - 118,596.
Gozo - - - - 15,459.

Yearly increase of population:—

Malta - - - about 1,000.
Gozo - - - „ 80.

Decrease in 1865 in consequence of cholera:—

Malta - - - - 1,366.
Gozo - - - - 68.

(Signed) H. ZIMELLI,
Superintendent of Police.

23rd April 1867.

TABLE II., showing the ADMISSIONS and DEATHS among TROOPS and among SOLDIERS' WIVES and CHILDREN in MALTA and GOZO from DIARRHŒA and CHOLERA.

Average Strength during 1865 { Men - - 6,105. Women - - 526. Children - 838.

From 1st April to 30th November 1865.				From 1st Jan. to 31st Dec. 1865.				From 1st January to 31st December 1865.			
Men.				Women.				Children.			
Diarrhœa.		Cholera.		Diarrhœa.		Cholera.		Diarrhœa.		Cholera.	
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
653	5	126	90	83	—	48	34	206	57	25	18

TABLE showing the TOTAL ADMISSIONS and DEATHS from DIARRHŒA and CHOLERA among MEN of each CORPS in MALTA and GOZO between April 1st and November 30th, 1865.

Name of Corps.	Average Strength.	Total Diarrhœa.		Total Cholera.	
		Cases.	Deaths.	Cases.	Deaths.
3/ Royal Artillery -	791	83	—	17	11
Royal Engineers - -	181	13	1	—	—
2/4 - - - -	742	84	2	21	16
2/8 - - - -	771	51	—	6	5
1/22 - - - -	713	35	—	13	8
29 - - - -	706	116	—	18	16
84 - - - -	724	100	—	20	12
100 - - - -	719	95	—	22	18
R. M. F. A. - - -	582	71	2	9	4
A. H. Corps - -	40	1	—	—	—
2/22* - - - -	758	4	—	—	—
Total -	—	653	5	126	90

* Embarked for the Mauritius on the 6th July 1865.

A. H. ANDERSON, M.D.

TABLE III.—DAILY CASES and DEATHS from CHOLERA among the various CLASSES of POPULATION in MALTA and GOZO during the Epidemic of 1865.

Date. 1865.		Cases.			Deaths.			Total.	
		Soldiers and their Families.	Malta.	Gozo.	Soldiers and their Families.	Malta.	Gozo.	Cases.	Deaths.
June	20	1	—	—	—	—	—	1	—
,,	21	—	—	—	1	—	—	—	1
,,	22	1	—	—	—	—	—	1	—
,,	23	1	—	—	1	—	—	1	1
,,	24	—	—	—	—	—	—	—	—
,,	25	—	—	—	—	—	—	—	—
,,	26	—	—	—	—	—	—	—	—
,,	27	—	—	—	1	—	—	—	1
,,	28	1	—	—	—	—	—	1	—
,,	29	1	1	—	—	1	—	2	1
,,	30	—	—	—	1	—	—	—	1
July	1	5	—	—	—	—	—	5	—
,,	2	—	—	—	1	—	—	—	1
,,	3	1	1	—	—	1	—	2	1
,,	4	—	—	—	—	—	—	—	—
,,	5	—	—	—	—	—	—	—	—
,,	6	4	—	—	2	—	—	4	2
,,	7	1	—	—	—	—	—	1	—
,,	8	—	2	—	2	1	—	2	3
,,	9	2	—	—	—	1	—	2	1
,,	10	—	2	—	2	1	—	2	3
,,	11	1	1	—	—	1	—	2	1
,,	12	—	2	—	1	1	—	2	2
,,	13	3	3	—	1	1	—	6	2
,,	14	1	4	—	1	2	—	5	3
,,	15	—	—	—	—	—	—	—	—
,,	16	1	10	—	1	8	—	11	9
,,	17	2	12	—	2	10	—	14	12
,,	18	1	7	—	—	4	—	8	4
,,	19	1	2	—	1	3	—	3	4
,,	20	2	22	—	1	9	—	24	10
,,	21	—	15	1	—	12	—	16	12
,,	22	6	17	—	3	12	—	23	15
,,	23	5	15	—	4	13	—	20	17
,,	24	5	20	4	4	8	1	29	13
,,	25	4	22	2	5	16	—	28	21
,,	26	7	27	1	2	17	2	35	21
,,	27	5	33	1	1	15	—	39	16
,,	28	4	33	2	3	13	1	39	17
,,	29	2	27	1	6	19	—	30	25
,,	30	6	27	1	3	20	2	34	25
,,	31	—	30	3	6	18	2	33	26
August	1	3	31	—	2	16	—	34	18
,,	2	2	32	3	1	23	1	37	25
,,	3	1	25	2	2	24	1	28	27
,,	4	2	47	6	—	24	1	55	25
,,	5	2	54	7	3	35	3	63	41
,,	6	3	46	3	2	29	1	52	32
,,	7	4	66	5	3	31	1	75	35
,,	8	2	48	10	1	24	3	60	28
,,	9	3	73	7	4	32	10	83	46
,,	10	1	42	10	—	28	2	53	30
,,	11	—	45	9	1	25	6	54	32
,,	12	6	61	4	2	30	7	71	39
,,	13	8	48	10	4	33	4	66	41
,,	14	3	52	7	3	35	4	62	42
,,	15	3	60	11	—	32	2	74	34
,,	16	2	50	11	5	29	9	63	43
,,	17	5	44	10	2	35	1	59	38
,,	18	1	41	3	1	25	3	45	29
,,	19	3	49	3	2	21	3	55	26
,,	20	4	35	14	6	19	8	53	33
,,	21	1	36	10	—	21	2	47	23
,,	22	1	32	13	1	25	6	46	32
,,	23	—	38	10	—	26	7	48	33
,,	24	1	47	6	1	27	6	54	34
,,	25	2	36	15	1	19	5	53	25
,,	26	1	48	5	1	20	6	54	27
,,	27	3	29	10	1	20	3	42	24
,,	28	2	38	12	1	26	5	42	32
,,	29	2	41	9	1	29	6	52	36
,,	30	—	42	12	2	21	5	54	28
,,	31	2	48	8	2	26	1	58	29

Table III.—Daily Cases and Deaths from Cholera—*continued.*

Date. 1865.		Cases.			Deaths.			Total.	
		Soldiers and their Families.	Malta.	Gozo.	Soldiers and their Families.	Malta.	Gozo.	Cases.	Deaths.
September	1	5	18	7	2	16	3	30	21
,,	2	1	29	10	3	17	6	40	26
,,	3	2	29	7	1	16	6	38	23
,,	4	2	20	8	1	17	3	30	21
,,	5	—	16	6	1	14	3	22	18
,,	6	1	14	4	—	8	2	19	10
,,	7	4	15	7	2	4	2	26	8
,,	8	—	21	5	—	12	2	26	14
,,	9	1	17	5	—	15	3	23	18
,,	10	3	13	8	2	12	2	24	16
,,	11	1	18	4	1	6	2	23	9
,,	12	1	22	4	1	13	1	27	15
,,	13	—	15	7	—	17	4	22	21
,,	14	—	26	6	—	11	2	32	13
,,	15	1	22	7	—	16	2	30	18
,,	16	1	33	6	2	14	4	40	20
,,	17	—	25	7	—	19	1	32	20
,,	18	—	35	6	—	18	6	41	24
,,	19	—	14	8	—	21	3	22	24
,,	20	5	21	7	—	21	5	33	26
,,	21	3	19	9	2	8	—	31	10
,,	22	3	27	10	1	11	4	40	16
,,	23	—	11	10	—	14	4	21	18
,,	24	1	11	6	1	18	4	18	23
,,	25	3	7	8	—	6	2	18	8
,,	26	1	7	9	2	6	4	17	12
,,	27	1	3	11	1	5	2	15	8
,,	28	—	7	1	—	5	—	8	5
,,	29	—	12	4	1	3	5	16	9
,,	30	—	9	7	1	6	1	16	8
October	1	1	7	3	—	8	1	11	9
,,	2	—	7	8	—	8	3	15	11
,,	3	—	—	4	—	4	7	4	11
,,	4	—	7	3	—	6	—	10	6
,,	5	—	4	—	—	5	1	4	6
,,	6	—	6	6	—	4	1	12	5
,,	7	—	1	8	—	2	4	9	6
,,	8	—	5	3	—	1	1	8	2
,,	9	1	3	2	1	2	—	6	3
,,	10	—	6	10	—	2	3	16	5
,,	11	—	8	2	—	4	1	10	5
,,	12	—	3	3	—	3	2	6	5
,,	13	—	3	5	—	3	1	8	4
,,	14	—	1	5	—	—	—	6	—
,,	15	—	4	4	—	—	1	8	1
,,	16	—	6	4	—	1	6	10	7
,,	17	—	6	2	—	6	—	8	6
,,	18	—	2	2	—	3	—	4	3
,,	19	—	3	2	—	4	1	5	5
,,	20	1	5	1	—	6	1	7	7
,,	21	1	4	—	—	1	—	5	1
,,	22	—	—	1	—	5	—	1	5
,,	23	1	1	—	1	1	—	2	2
,,	24	1	—	2	—	—	—	3	—
,,	25	1	3	—	—	2	—	4	2
,,	26	1	1	—	—	2	—	2	2
,,	27	1	—	—	1	—	—	1	1
,,	28	—	2	—	2	2	—	2	4
,,	29	2	2	—	—	1	—	4	1
,,	30	—	1	—	2	1	—	1	3
,,	31	—	2	—	—	2	—	2	2
November	1	1	—	—	1	—	—	1	1
,,	2	—	1	—	—	—	—	1	—
,,	3	1	1	—	—	1	—	2	1
,,	4	—	—	—	—	1	—	—	1
,,	5	—	1	—	—	—	—	1	—
,,	6	—	—	—	—	—	—	—	—
,,	7	—	—	—	—	—	—	—	—
,,	8	—	—	—	—	—	—	—	—
,,	9	—	1	—	—	—	—	1	—
,,	10	—	—	—	—	1	—	—	—
,,	11	—	—	—	—	1	—	—	—
,,	12	2	—	—	—	—	—	2	—
,,	13	—	—	—	1	—	—	—	—

…g the Sex and Age of the Persons among the Civil Populations of Malta and Gozo who died of Cholera during the Epidemic of 1865. (Prepared by Dr. Ghio).

	Months.																								Years.																								Total.		
	…der 1.		2 to 3.		3 to 4.		4 to 5.		6 to 7.		7 to 8.		8 to 9.		9 to 10.		10 to 11.		11 to 12.		1 to 2.		2 to 3.		3 to 4.		4 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 25.		25 to 30.		30 to 35.		35 to 40.		40 to 45.		45 to 50.		50 to 55.		55 to 60.		60 to 65.		65 to 70.		70 to 75.		75 to 80.		80 to 85.		85 to 90.		90 to 95.		95 to 100.				
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Both Sexes.
-	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	9	8	4	7	6	4	4	3	9	9	9	9	6	7	13	10	10	5	6	10	6	9	6	10	6	8	14	11	2	8	9	9	4	6	2	6	4	1	4	.	.	.	1	.	1	133	149	282
-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	1	1	1	.	.	.	3	1	1	2	1	.	3	2	1	.	4	3	2	2	2	.	4	1	3	.	1	.	2	.	1	.	3	1	1	.	.	.	.	.	.	17	31	48
-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	1	2	.	.	.	.	.	.	.	.	.	.	.	5	2	7
-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	.	.	.	.	1	.	.	.	.	1	.	1	.	.	.	.	.	.	1	.	.	.	.	.	1	.	.	.	2	1	.	4	2	3	3	5	1	5	.	2	.	.	10	25	35
-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	..	2
-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	.	4	3	4	.	1	3	1	2	4	2	1	.	2	3	2	.	.	1	2	.	4	2	.	1	4	2	1	4	2	1	1	.	2	3	2	1	1	.	2	.	.	.	23	41	64
-	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1	.	4	.	3	4	7	3	3	1	8	6	4	4	1	1	.	2	3	2	9	2	2	2	5	2	9	2	4	2	4	2	1	1	.	2	3	1	1	3	5	.	1	.	.	.	.	60	62	122
-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	3
-	.	.	.	.	.	.	.	.	1	.	1	1	.	.	.	.	.	.	.	.	3	2	.	.	1	5	6	3	2	8	8	5	2	.	.	3	.	5	4	3	.	1	2	4	3	.	5	1	5	1	4	.	3	2	2	.	2	2	2	.	2	.	1	.	.	.	40	67	107
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and Rabato	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	2	2	.	2	1	3	.	.	.	3	4	5	2	4	2	3	1	3	4	3	1	1	6	1	1	3	8	.	.	3	4	2	3	.	3	.	.	1	.	.	.	38	52	90
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Giuseppe, Samra, Sta. Venera, Marsa.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1	2	1	1	3	.	4	1	1	.	.	.	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	12	14	26
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TABLE V.—Showing the DAILY NUMBER of PERSONS in QUARANTINE from 14th June to 31st July 1865, and the Cases of DIARRHŒA and CHOLERA which occurred among them whilst in the LAZARETTO. (Prepared by Dr. Ghio.)

Date.	ADMITTED. Number of Passengers landed.	From which Ship landed.	Persons who communicated with Passengers or Crew.	Health Guards.	IN QUARANTINE. Number of Passengers.	Persons who communicated with Passengers or Crew.	Health Guards.	Total.	DISCHARGED. Number of Passengers.	From which Ship landed.	Persons who communicated with Passengers or Crew.	Health Guards.
June 14	22	"Memnon"	..	2								
	47	"Cairo"	..	4	76	..	7	83	..	..	..	..
	7	"Nyanza"	..	1								
15	..	..	..	..	76	..	7	83	..	..	..	..
16	..	..	..	..	76	..	7	83	..	..	..	..
17	1	"M. Antonietta"	..	1	77	..	8	85	..	..	..	..
18	..	..	..	..	77	..	8	85	..	..	..	..
19	30	"Assyrien"	..	4	107	..	12	119	..	..	..	..
20	147	"Rhone"	10	12	254	10	24	288	..	..	..	..
21	..	..	..	..	254	10	24	288	..	..	..	..
22	44	"Laconia"	14	6	222	24	23	269	22	"Memnon"	..	2
									47	"Cairo"	..	4
									7	"Nyanza"	..	1
23	65	"Christina"	10	6	287	34	29	350	..	..	..	..
24	176	"Italian"	2	9	462	36	37	535	1	"M. Antonietta"	..	1
25	2	"Tarifa"	1	1	464	37	38	539	..	..	..	..
26	..	..	..	..	464	37	38	539	..	..	..	..
27	..	..	..	..	289	27	24	340	30	"Assyrien"	..	4
									145	"Rhone"	10	10
28	302	"Wyvern"	7	12	591	34	36	661	..	..	..	..
29	20	"Danube"	1	3	566	21	33	620	44	"Laconia"	14	6
									1 *d*	"Wyvern"	..	..
30	..	..	..	..	499	11	25	535	65	"Christina"	10	6
July 1	8	"Ellora"	42	4					2	"Rhone"	..	2
	60	"Delta"	4	6								
	34	"Morocco"	..	3								
	337	"Behera"	6	9	840	64	44	948	176	"Italian"	2	9
	37	"Ionia"	2	4					1 *d*	"Wyvern"	..	..
	42	"Ceylon"	1	2								
2	129	"Cella"	..	7	967	63	50	1,080	2	"Tarifa"	1	1
3	13	"Dalmation"	..	2	980	63	52	1,095	..	..	..	..
4	..	..	4 *a*	..	979	66	52	1,097	1 *d*	"Wyvern"	1 *a*	..
5	1	"Grecian"	14	1					..	..	..	..
	2	"Asie"	10	1	982	90	54	1,126				
6	..	..	..	1	961	89	52	1,102	20	"Danube"	1	3
									1 *d*	"Wyvern"	..	..
7	249	"Luxor"	..	10	1,208	89	62	1,359	1 *d*	"	..	..
									1 *d*	"Dalmatian"	..	..
8	..	..	..	..	1,712	83	53	1,248	60	"Delta"	4	6
									34	"Morocco"	..	3
									..	"Grecian"	2 *d*	..
									1 *d*	"Asie"	..	..
									1 *d*	"Wyvern"	..	..
9	..	..	3	..	1,033	83	47	1,163	37	"Ionia"	2	4
									42	"Ceylon"	1	2
10	..	..	..	..	1,033	82	47	1,162	..	"Grecian"	1 *d*	..
11	1	"Tripoli"	..	..	704	76	39	819	337	"Behera"	6	9
	7	"Poonah"	..	1								
12	..	..	..	..	696	34	35	765	8	"Ellora"	42	4
13	..	..	..	..	695	34	34	763	1 *d*	"Luxor-Wyvern"	..	1 *d*
14	..	..	..	..	695	34	34	763	..	..	..	..
15	140	"Sahara"	..	8	458	34	25	517	129	"Cella"	..	7
									248	"Luxor"	..	10
16	..	..	..	..	447	34	23	504	11	"Dalmatian"	..	2
17	..	..	..	..	447	34	23	504	..	..	..	..
18	..	..	..	..	446	24	22	492	..	"Asie"	10	1
									1 *d*	"Wyvern"	..	..
19	..	..	..	..	444	24	20	488	1	"Tripoli"	..	1
									1	"Wyvern"	..	1
20	1	"Arcadia"	..	1	406	9	15	430	39	"	6	5
									..	"Grecian"	9	1
21	1	"Prince of Wales"	..	1	397	9	16	422	1 *d*	"Wyvern"	..	..
									1	"Dalmatian"	..	..
									1	"Asie"	..	..
									7	"Wyvern"	..	..
22	5	"Poonah"	..	..	262	9	8	279	140	"Sahara"	..	8
23	2	"Ripon"	..	1	264	9	9	282	..	..	..	..
24	93	"Atlantic"	..	5	345	9	13	367	12	"Poonah"	..	1
25	15	"Wyvern"	..	1	346	9	14	369	..	..	..	..
		"Sicilian"	..	1								
26	1	"Delta"	..	1	346	10	15	371	1	"Grecian"	1	..
		"Aghia Sophia"	2	..								
27	..	..	..	..	345	10	14	369	1	"Arcadia"	..	1
28	..	..	..	..	344	10	13	367	1	"Prince of Wales"	..	1
29	..	..	..	..	96	2	7	105	248	"Wyvern"	7	6
									..	"Grecian"	1	..
30	2	"Egyptian"	1	1	96	5	8	109	2	"Ripon"	..	1
		"Corcyra"	2	1								
31	1	"Euxine"	1	1	98	7	10	115	..	..	..	..
	1	"Ceylon"	1	1								
	2,031		138	134	98	7	10	115	1,933		131	124

(*a*) Hospital servants. (*b*) Born at Lazaretto. (*d*) Died.

CASES of DIARRHŒA and CHOLERA in the LAZARETTO.

Date of Attack.	Name of Persons.	Sex.	Name of Ship from which landed or with which they communicated.	Date of Ship's Arrival.	Form of Disease.	Result and Date.	Date of Attack.	Name of Persons.	Sex.	Name of Ship from which landed or with which they communicated.	Date of Ship's Arrival.	Form of Disease.	Result and Date.
June 23	C.S.	M	"Christina"	June 22	Diarrhœa	*r.* June 24	July 5	T.F.	M	"Grecian"	July 5	Cholera	*r.* July 12
23	S.B.	F	"Rhone"	20	Diar. & vomit.	*r.* 25	5	J.F.	F	"Asie"	5	Do.	*d.* 8
24	E.S.	M	"	20	Diarrhœa	*r.* 26	6	L.B.	M	"	5	Do.	*r.* 8
24	G.M.	M	"	20	Do.	*r.* 26	6	S.M.	M	"Cella"	2	Diarrhœa	*r.* 8
26	G.C.	M	"Italian"	23	Diar. & vomit.	*r.* 27	6	R.G.	M	"Wyvern"	June 28	Cholera	*d.* 6
28	G.M.	M	"Wyvern"	28	Cholera (*l*)	*d.* 28	6	G.P.	M	"	28	Do.	*r.* 8
28	S.M.	M	"	28	Do. (*l*)	*r.* July 8	6	C.C.	M	" (*g*)	28	Do.	*d.* 12
28	C.P.	F	"	28	Do.	*d.* 3	7	C.M.	F	"	28	Do.	*d.* 8
29	G.P.	F	"	28	Do.	*d.* June 29	7	G.Z.	M	"Grecian (*c*)	July 5	Do.	*d.* 7
29	F.C.	M	"	28	Do.	*d.* July 1	7	C.T.	M	" (*c*)	5	Do.	*r.* 1
30	R.D.	F	"	28	Diarrhœa	*r.* 5	7	C.A.	M	" (*c*)	5	Do.	*d.*
July 2	A.P.	M	"Delta"	28	Do.	*r.* 4	7	G.A.	M	" (*c*)	5	Do.	*r.*
3	R.T.	M	"Wyvern"	28	Diar. & vomit.	*r.* 5	8	P.C.	M	" (*c*)	5	Do.	*d.*
3	J.F.	M	"Dalmatian"	July 3	Cholera (*l*)	*d.* 6	8	F.M.	M	" (*c*)	5	Do.	
4	W.G.G.	M	"	3	Do.	*r.* 8	8	S.B.	M	" (*c*)	5	Diarrhœa	
4	G.M.	M	"Behera"	1	Diarrhœa	*r.* 5	9	G.V.	M	"Behera"	1	Do.	
4	L.B.	M	"	1	Do.	*r.* 5	9	G.F.	F	"Luxor"	7	Do.	
4	G.A.V.	M	"	1	Do.	*r.* 6	11	E.F.	F	"Wyvern"	June 28	Cholera	
4	T.G.	M	"Cella"	2	Do.	*r.* 5	16	G.V.	M	"Cella"	July 2	Diarrh	
4	A.C.	M	"Wyvern"	June 28	Cholera	*d.* 5	24	E.W.	M	"Atlantic"	June 28	Chol	
											July 24		

(*g*) Health guard. (*c*) Coal labourer. *r.* Recovered. *d.* Died. *l.* Landed fr

All the above-mentioned ships arrived from Alexandria.

TABLE VI.—Weekly Abstract of CASES of CHOLERA among the CIVIL POPULATION in the Cities and Villages of Malta during the Epidemic of 1865.

Places.	Weeks ending July 5.	July 12.	July 19.	July 26.	Aug. 2.	Aug. 9.	Aug. 16.	Aug. 23.	Aug. 30.	Sept. 6.	Sept. 13.	Sept. 20.	Sept. 27.	Oct. 4.	Oct. 11.	Oct. 18.	Oct. 25.	Nov. 1.	Nov. 8.	Nov. 15.	Total Cases.
Attard	1	.	.	.	.	2	.	7	1	.	.	.	5	3	.	.	.	.	.	.	19
Valletta	1	2	7	36	81	93	71	52	42	20	12	24	8	.	4	.	.	1	.	.	454
Cospicua	.	1	6	15	18	33	20	18	18	3	12	11	7	3	3	3	3	1	.	.	175
Floriana	.	1	8	11	16	12	13	2	7	3	1	1	1	.	.	.	.	.	.	.	76
Misida	.	.	7	8	3	8	12	7	6	4	.	.	.	.	.	.	.	.	.	.	55
Rabato and Notabile	.	.	1	3	4	13	25	17	24	22	19	8	4	2	1	.	.	.	.	.	143
Birchircara	.	.	1	3	13	37	34	19	7	13	7	2	3	1	1	.	1	.	.	.	142
Corradino	.	.	1	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Vittoriosa	.	.	.	4	6	29	35	25	17	10	7	23	8	6	3	1	.	1	.	.	175
Curmi	.	.	.	3	13	24	34	35	28	10	6	5	.	.	.	.	1	.	.	.	159
Musta	.	.	.	2	4	1	2	1	3	5	2	1	1	.	.	.	.	.	.	.	22
Senglea	.	.	.	5	13	12	13	6	24	15	4	3	4	.	.	.	.	.	.	.	99
Naxaro	.	.	.	3	.	3	4	10	6	3	1	3	.	.	.	.	.	.	.	.	33
Micabiba	.	.	.	3	7	9	4	6	.	.	.	1	4	.	.	.	.	.	.	.	34
Zebbug	.	.	.	2	7	16	13	13	14	9	10	8	2	.	2	1	2	.	.	.	99
Zabbar	.	.	.	3	5	24	13	7	8	4	2	9	7	2	3	1	.	.	.	.	88
Via San Giuseppe	.	.	.	3	4	3	15	3	8	3	.	1	.	.	.	.	.	.	.	.	40
Sliema	.	.	.	1	1	5	6	3	4	1	2	1	.	.	.	.	.	.	.	.	24
Zurrico	.	.	.	.	3	2	.	1	3	2	3	3	2	2	2	2	4	2	3	.	34
San Giuliano	.	.	.	.	1	.	2	3	.	.	1	.	.	.	.	.	.	.	.	.	7
Gargur	.	.	.	.	1	.	.	1	3	3	.	.	1	.	.	.	.	.	.	.	9
Zeitun	.	.	.	.	5	3	16	18	16	17	13	40	13	9	5	7	1	1	.	.	164
Calcara	.	.	.	.	1	1	1	2	2	.	.	1	.	.	.	.	.	.	.	.	8
Gudia	.	.	.	.	1	1	.	.	.	1	2	4	1	1	.	.	.	.	.	.	11
Axiack	.	.	.	.	.	1	5	1	3	6	3	5	1	11	.	.	1	.	.	.	37
Balzan	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Lia	.	.	.	.	.	3	1	.	1	.	1	1	.	1	.	1	1	2	.	.	12
Paola	.	.	.	.	.	2	1	.	.	.	.	.	1	.	.	.	.	.	.	.	4
Tarxien	.	.	.	.	.	4	7	6	3	1	.	.	.	.	.	.	.	.	.	1	22
Siggieui	.	.	.	.	.	2	3	6	15	1	10	16	6	3	1	5	2	.	.	.	70
Crendi	.	.	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.	2
Luca	.	.	.	.	.	.	1	2	.	.	1	2	5	3	4	2	.	.	.	.	20
Melleha	.	.	.	.	.	.	1	.	.	1	.	1	.	.	.	.	.	.	.	.	3
St. Paul's Bay	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Safi	.	.	.	.	.	.	1	.	.	.	.	.	.	2	4	1	.	.	.	.	8
Chircop	.	.	.	.	.	.	.	1	.	1	.	1	.	.	.	1	.	.	.	.	4
Dingli	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	1
Weekly totals	2	4	31	108	207	345	354	272	264	158	119	175	85	49	33	25	16	8	3	1	2,259

TABLE VII.—Weekly Abstract of DEATHS from CHOLERA among the CIVIL POPULATION in the Cities and Villages of Malta during the Epidemic of 1865.

Places.	Weeks ending July 5.	July 12.	July 19.	July 26.	Aug. 2.	Aug. 9.	Aug. 16.	Aug. 23.	Aug. 30.	Sept. 6.	Sept. 13.	Sept. 20.	Sept. 27.	Oct. 4.	Oct. 11.	Oct. 18.	Oct. 25.	Nov. 1.	Nov. 8.	Nov. 9–11.	Total Deaths in each Place.	Population 1861.	Deaths per 1,000.
Attard	1	.	.	.	.	.	1	3	3	.	.	.	2	.	1	.	.	.	.	.	11	1,239	8
Valletta	1	2	6	26	36	51	48	30	34	10	11	15	8	1	1	1	.	1	.	.	282	23,993	11
Cospicua	.	1	5	10	14	21	10	11	10	3	8	13	5	2	.	2	4	3	.	.	122	10,933	11
Floriana	.	1	5	6	11	8	7	.	3	4	1	1	1	.	.	.	.	.	.	.	48	5,791	8
Misida	.	.	6	8	2	4	7	5	4	3	.	.	.	.	.	.	.	.	.	.	39	1,858	20
Rabato and Notabile	.	.	1	3	3	10	13	9	14	10	14	9	2	2	1	.	.	.	.	.	91	5,916	15
Birchircara	.	.	1	1	7	17	26	16	7	10	5	2	3	1	1	.	1	.	.	.	98	5,978	16
Corradino	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	187	16
Vittoriosa	.	.	.	2	4	11	21	18	10	7	5	15	4	6	3	.	.	1	.	.	107	5,712	18
Curmi	.	.	.	1	10	10	19	20	17	7	2	4	1	.	.	.	1	.	.	.	92	6,001	15
Musta	.	.	.	1	4	1	.	.	1	5	1	1	.	.	.	.	.	.	.	.	14	3,828	3
Senglea	.	.	.	.	4	8	10	5	13	12	5	2	4	1	.	.	.	.	.	.	64	6,887	9
Naxaro	.	.	.	2	1	2	2	7	2	1	.	1	1	.	.	.	.	.	.	.	19	2,768	6
Micabiba	.	.	.	3	4	6	1	1	1	.	.	1	2	.	.	.	.	.	.	.	19	894	21
Zebbug	.	.	.	1	3	10	8	12	6	5	5	5	3	.	1	1	2	.	.	.	62	4,884	12
Zabbar	.	.	.	.	5	16	5	2	4	3	3	6	3	4	1	1	.	1	.	.	54	4,327	12
Via San Giuseppe	.	.	.	2	1	2	8	8	2	2	1	.	.	.	.	.	.	.	.	.	26	1,578	16
Sliema	.	.	.	.	1	2	4	3	2	.	1	1	.	.	.	.	.	.	.	.	14	324	.
Zurrico	.	.	.	.	2	.	.	1	1	2	2	2	2	.	1	5	1	2	1	.	24	2,797	8
San Guiliano	.	.	.	.	1	.	2	3	.	.	1	.	.	.	.	.	.	.	.	.	7	476	.
Gargur	.	.	.	.	1	.	.	1	.	3	.	.	1	.	.	.	.	.	.	.	6	1,200	5
Zeitun	.	.	.	.	1	4	7	8	5	7	3	21	11	8	3	4	2	.	.	.	84	5,491	15
Calcara	.	.	.	.	.	1	.	1	2	.	.	1	.	.	.	.	.	.	.	.	5	436	11
Gudia	.	.	.	.	1	.	.	.	.	.	1	1	1	1	.	.	.	.	.	.	5	932	5
Axiack	.	.	.	.	.	.	3	.	2	4	1	4	2	5	2	.	1	.	.	.	24	1,200	20
Balzan	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	662	.
Lia	.	.	.	.	.	2	1	1	.	.	1	1	.	1	.	.	.	1	.	.	8	1,371	5
Paola	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	2	485	4
Tarxien	.	.	.	.	.	1	2	2	3	.	1	.	.	.	.	.	.	.	.	1	10	1,265	7
Siggieui	.	.	.	.	.	.	2	3	3	1	4	9	8	3	1	5	1	.	.	.	40	2,641	15
rendi	.	.	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.	2	949	2
	.	.	.	.	.	.	.	.	.	.	1	4	4	2	3	1	1	.	.	.	16	1,592	10
2	.	.	.	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	2	975	2
Bay	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	476	.
	.	.	.	.	.	.	.	.	1	.	.	.	.	2	.	1	.	.	.	.	4	286	14
	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	1	409	.
	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	1	594	.
	2	4	25	68	116	190	210	171	151	99	77	120	68	40	20	16	19	8	2	2	1,408	.	.

TABLE VIII.—Weekly Abstract of CASES of CHOLERA among the CIVIL POPULATION in the Cities and Villages of Gozo during the Epidemic of 1865.

Places.	Weeks ending July 27.	Aug. 3.	Aug. 10.	Aug. 17.	Aug. 24.	Aug. 31.	Sept. 7.	Sept. 14.	Sept. 21.	Sept. 28.	Oct. 5.	Oct. 12.	Oct. 19.	Oct. 26.	Total Cases in each Place.
Xeuchia	9	7	2	1	7	2	—	5	3	1	—	—	1	—	38
Rabato	—	1	26	33	32	33	23	12	11	7	—	—	—	—	178
Caccia	—	1	2	—	1	—	1	3	12	26	12	11	8	2	79
Nadur	—	—	1	3	—	6	1	—	1	—	—	1	—	—	13
Sannat	—	—	6	9	3	14	3	4	3	1	—	—	—	—	43
Marsalforn	—	—	1	2	—	—	—	—	—	—	—	—	—	—	3
Garbo	—	—	2	—	3	7	7	5	6	10	9	6	12	1	68
Munxar	—	—	1	3	—	1	—	3	—	1	1	2	—	—	12
Santa Lucia	—	—	—	1	—	—	—	3	—	—	—	—	—	—	4
Kercem	—	—	—	3	2	2	6	1	3	1	—	1	—	—	19
Zebbug	—	—	—	1	5	4	6	1	5	6	4	7	2	1	42
Ghain Sielem	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
Kala	—	—	—	—	—	—	—	—	1	—	—	1	—	—	2
Ghammar	—	—	—	—	—	—	—	1	1	2	3	3	1	—	11
Weekly totals	9	9	41	56	53	69	48	38	46	55	29	32	24	4	513

TABLE IX.—Weekly Abstract of DEATHS from CHOLERA among the CIVIL POPULATION in the Cities and Villages of Gozo during the Epidemic of 1865.

Places.	Weeks ending July 27.	Aug. 3.	Aug. 10.	Aug. 17.	Aug. 24.	Aug. 31.	Sept. 7.	Sept. 14.	Sept. 21.	Sept. 28.	Oct. 5.	Oct. 12.	Oct. 19.	Oct. 26.	Total Deaths in each Place.	Population 1861.	Deaths per 1,000.
Xeuchia	3	5	2	1	2	2	2	1	—	—	1	—	—	—	18	1,345	13
Rabato	—	—	9	19	14	12	10	6	1	3	—	—	—	—	74	4,023	18
Caccia	—	—	2	—	—	2	—	1	3	6	7	6	2	1	30	1,996	15
Nadur	—	—	—	1	1	3	—	—	1	—	—	—	—	—	6	2,546	2
Sannat	—	—	2	4	5	6	2	1	3	2	—	—	—	—	25	793	31
Marsalforn	—	—	—	1	1	—	—	—	—	—	—	—	—	—	2	25	80
Garbo	—	—	1	—	1	2	6	2	6	4	4	2	5	—	33	1,295	25
Munxar	—	—	—	2	1	—	—	—	—	1	—	1	—	—	5	147	34
Santa Lucia	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	232	4
Kercem	—	—	—	1	1	—	4	2	1	—	—	—	—	—	9	793	11
Zebbug	—	—	—	—	3	2	1	1	2	2	4	3	—	—	18	556	
Ghain Sielem	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	916	
Kala	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	500	2
Ghammar	—	—	—	—	—	—	—	1	—	1	3	—	—	—	5	263	19
Weekly totals	3	5	16	29	29	29	25	16	18	19	18	12	7	1	227	—	—

TABLE X.—METEOROLOGICAL OBSERVATIONS for the Year 1865, noticing the PRESSURE of the ATMOSPHERE, the TEMPERATURE and HUMIDITY of the AIR, the FALL of RAIN, the AMOUNT of OZONE and CLOUD, the prevailing WINDS, and the VARIATIONS in the WEATHER.

Year and Month, 1865.	Locality at which Observations were made.	Reading of Barometer, No. 517. Mean for Month.	Highest in Month.	Lowest in Month.	Range.	Temperature of Air. Highest in Month.	Lowest in Month.	Range in Month.	Mean of all Highest.	Mean of all Lowest.	Mean Daily Range.	Approximate Mean for Month.	Dry and Wet Bulb. Mean of Dry Bulb.	Mean of Wet Bulb.	Mean deduced Dew Point.	Mean Degree of Humidity.	Rain. Number of Days it fell.	Amount collected.	Ozone. Mean at 9h. a.m.	Mean at 3h. p.m.	Wind. General Directions.	Estimated Strength.	Cloud. 9 a.m. 0–10.	3 p.m. 0–10.
		in.	in.	in.	in.	°	°	°	°	°	°	°	°	°	°			in.						
January	Garrison Hospital, Valetta.	29·764	30·162	29·410	·752	71·1	48·5	22·6	62·3	53·6	8·7	57·9	59·2	54·6	50·5	73	8	1·83	Not taken		N.W.	1·5	5·4	5·1
February		29·663	30·048	29·328	·720	64·8	37·1	27·7	57·5	48·7	8·8	53·1	54·3	49·8	46·2	73	19	4·13	Do.		N.W.	2·2	6·4	6·7
March		29·648	30·030	29·112	·918	70·2	45·8	24·4	60·0	51·4	8·6	55·7	57·2	51·2	45·2	66	11	·67	Do.		N.W.	2·3	6·5	5·6
April		29·978	30·230	29·598	·632	70·2	47·3	22·9	63·5	55·4	8·1	59·4	61·5	55·8	50·9	72	4	·15	Do.		N.E.	1·8	4·1	3·8
May		29·915	30·248	29·784	·464	85·1	56·0	29·1	75·2	64·0	11·2	69·6	71·3	63·6	57·9	65	None		5·7	3·0	N.E.	·9	4·3	4·2
June		29·900	30·120	29·876	·244	86·0	64·2	21·8	79·5	69·5	10·0	74·5	76·4	68·4	62·6	63	3	·21	5·1	2·7	N.E.	1·0	4·2	4·0
July		29·831	30·098	29·800	·298	92·1	71·8	20·3	85·2	74·5	10·7	79·8	82·1	72·8	66·5	73	None		4·6	2·6	N.W.	·7	2·0	1·5
August		29·837	30·082	29·850	·232	94·5	72·6	21·9	87·1	76·3	10·8	81·7	83·5	74·6	67·8	63	None		4·8	2·4	N.W.	·8	2·1	1·9
September		29·963	30·184	29·908	·276	86·2	61·6	24·6	81·1	70·4	10·7	75·7	78·1	69·7	63·9	62	6	4·61	6·0	4·5	N.E.	·9	3·0	2·9
October		29·772	30·108	29·600	·508	84·2	59·6	24·6	76·3	67·8	8·5	72·0	73·6	66·9	61·9	68	6	2·75	5·9	4·2	N.W.	1·4	6 2	
November		29·835	30·214	29·528	·688	77·2	48·6	28·6	69·1	59·1	10·0	64·1	65·9	58·9	53·3	64	11	2·75	5·4	4·0	N.W.	1·3		
December		29·955	30·300	29·726	·574	69·8	47·9	21·9	61·7	53·9	7·8	57·8	58·7	53·0	47·0	69	14	4·81	5·6	3·4	N.E.	1·		
Mean		29·889	30·152	29·626	·526	79·2	55·0	24·2	71·6	62·0	9·6	66·8	68·5	61·6	56·5	67·5	6·8	1·82	5·4	3·3				

TABLE XI.—Showing the COMPARATIVE NUMBERS of CASES of GASTRIC AFFECTIONS brought under Medical Treatment by the Police Physicians in the under-mentioned Districts of Malta and Gozo, during the first Six Months (Jan. 1st to June 30th) of 1864 and of 1865, preceding the Cholera of the latter Year.

Localities.	Dyspepsia and Gastricism.		Colic.		Diarrhœa.		Dysentery.		Sickness and Vomiting.		Enteritis and Gastroenteritis.		All other Diseases.	
	1864.	1865.	1864.	1865.	1864.	1865.	1864.	1865.	1864.	1865.	1864.	1865.	1864.	1865.
Valetta	160	148	76	100	46	66	7	5	—	1	52	42	1,071	1,035
Cospicua	220	256	10	43	132	94	76	108	—	—	267	293	2,296	1,748
Floriana	16	17	2	9	13	19	2	2	—	—	58	73	235	311
Misida	60	65	8	47	74	141	9	10	25	42	15	26	214	209
Rabato and Notabile	21	26	3	—	12	43	—	—	—	—	41	51	666	668
Birchircara	58	86	18	13	3	3	4	4	2	—	—	2	363	369
Vittoriosa	101	100	43	21	81	67	31	18	25	8	13	12	771	876
Curmi	129	199	—	—	9	15	6	9	1	—	36	29	400	463
Musta	116	151	54	51	46	39	18	15	—	—	38	43	903	873
Senglea	39	32	12	10	13	15	1	—	—	—	8	3	303	335
Micabiba	98	104	6	8	4	4	—	—	1	1	17	4	469	272
Zebbug	70	33	74	93	82	114	48	57	42	44	17	19	617	815
Zabbar	21	9	3	4	59	29	24	11	—	2	3	5	698	770
Via San Giuseppe	34	94	1	36	15	26	4	17	—	—	24	62	168	870
Slièma San Giuliano	10	—	—	—	2	8	—	2	—	—	2	1	29	127
Zurrico	2	27	5	3	6	5	3	6	—	—	2	2	569	1,409
Naxaro Gargur	33	22	69	86	11	12	9	4	—	—	11	4	250	371
Zeitun Axiack	118	108	26	46	111	126	73	119	13	9	174	217	1,472	1,877
Luca and Gudia	70	97	8	9	28	20	15	20	—	—	2	13	187	333
Lia	12	12	11	7	41	45	16	31	2	8	4	4	603	541
Tarxien	43	39	63	33	84	64	39	51	16	15	51	75	1,209	1,228
Siggieni	97	94	47	77	14	37	29	27	4	26	31	48	507	730
Crendi	61	81	5	9	2	7	—	—	—	—	26	14	432	269
Melleha	42	26	6	6	9	29	5	3	11	11	18	18	419	357
Chircop	25	33	1	1	—	1	—	—	—	—	8	4	244	82
Dingli	—	1	—	—	1	—	—	—	—	—	8	9	31	10
Rabato, Gozo	121	81	14	28	22	27	5	4	4	8	2	9	492	487
Caccia Nadur Kala Ghain Sielem	101	85	17	26	90	120	33	27	—	—	370	326	1,703	1,737
Sannat	15	27	6	7	—	14	—	1	1	—	1	—	112	132
Garbo	9	17	—	4	1	7	2	1	—	2	—	2	57	103
Zebbug, Gozo	13	15	7	—	1	—	1	2	—	—	—	3	50	50
Hospitals.														
[illegible]ral, Floriana	—	—	—	—	15	26	1	2	—	—	5	4	637	89[illegible]
Sto. Spirito, Notabile	—	1	—	—	5	9	—	3	2	8	—	—	106	10[illegible]
Civil Hospital, Gozo	—	—	—	—	10	11	4	—	—	—	3	1	100	88
	1,915	2,086	595	777	1,042	1,243	465	559	149	180	1,308	1,418	18,383	20,547

TABLE XII., showing the CAUSES of DEATH in MALTA and GOZO for Three Years, 1859–60–61, in comparison with the corresponding CAUSES of DEATH during the First Six Months of 1865. (Abstracted from the Census of 1861; and from Tables by Dr. Ghio for the First Six Months of 1865.)

Causes of Death.	Malta and Gozo.		Gozo alone.	
	Total Deaths in 1859–60–61.	Deaths, Jan. 1st to June 30th, 1865 (Dr. Ghio).	Total Deaths in 1859–60–61.	Deaths, Jan. 1st to June 30th, 1865 (Dr. Ghio).
Fevers	371	115	51	9
Small-pox	389	54	6	—
Hooping cough	154	62	26	—
Croup	95	34	7	—
Measles	131	56	1	—
Cholera	—	4	—	—
Other zymotic diseases	76	2	—	—
Cephalitis	127	30	7	—
Apoplexy	621	129	65	11
Convulsions	597	119	79	31
Other nervous diseases	132	12	5	3
Quinsy	49	43	5	26
Bronchitis	363	165	6	13
Pneumonia	393	118	65	13
Other respiratory diseases	251	56	36	7
[illegible]t diseases	210	60	7	2
[illegible]nteritis	1,214	406	172	27
[illegible]	—	—	—	13
[illegible]	—	—	—	4

Table XII.—Showing the Causes of Death in Malta and Gozo—*continued.*

Causes of Death.	Malta and Gozo.		Gozo alone.	
	Total Deaths in 1859-60-61.	Deaths, Jan. 1st to June 30th, 1865 (Dr. Ghio).	Total Deaths in 1859-60-61.	Deaths, Jan. 1st to June 30th, 1865 (Dr. Ghio).
Teething	1,827	84	153	4
Other diseases of digestive organs.	106	12	6	3
Liver disease and spleen disease	302	43	22	1
Diseases of urinary organs	57	7	5	—
Diseases of organs of generation	68	14	8	2
Diseases of bones	1	—	—	—
Diseases of integumentary system.	196	46	10	4
Phthisis	332	75	18	3
Atrophia mesenterica	566	92	42	1
Other constitutional diseases	138	29	10	2
Hœmorrhagies	64	10	11	—
Diseases of uncertain seat	669	142	85	12
Developmental diseases	—	—	—	1
Accidental	214	37	27	10
Old age and marasmus senilis	182	41	8	5
Unknown	12	—	—	—

Table XIII.—Statistics of Fever in 1865 in the under-mentioned Districts of Malta, received for Treatment into the Central Civil Hospital at Floriana.

District or Village.	Fever.		Dates of Cases.		Remarks.
	Cases.	Deaths.	Of 1st Case.	Of last Case.	
Zabbar	11	1	3rd January	28th November.	The disgusting state of personal filth in which each patient was received appeared to be the cause of the disease.
Valletta	38	6	8th „	29th December.	
Cospicua	6	2	10th „	21st September.	
Crendi	1	1	18th „	—	
Zeitun	67	12	23rd „	19th July.	
Floriana	16	2	24th „	26th December.	
Vittoriosa	1	—	31st „	—	
Merchant ships in great harbour.	12	1	11th February	10th December.	In proportion as the cholera invaded the island the fever diminished, but straggling cases continued to arrive as usual during the heat of summer.
Micabiba	5	—	14th „	27th June.	
Curmi	4	—	23rd „	13th July.	
St. Julian	1	—	„ „	—	
Safi	32	5	24th „	19th June.	
Zebbug	1	—	3rd March.	—	
Axiack	5	—	7th „	2nd June.	
Luca	4	1	8th „	9th October.	
Zurrico	10	1	16th „	11th June.	
Senglea	3	—	22nd „	24th June.	
Marsa	2	—	12th April	27th May.	
Tarxeen	3	—	14th „	12th October.	
Paola	1	—	17th May.	—	
Gargur	1	1	2nd June.	—	
Marsascirocco	1	1	8th „	—	
Birchircara	1	1	29th July.	—	
Corradino	1	—	3rd October.	—	
San Giuseppe	1	—	29th December.	—	
Misida	1	—	31st „	—	
Total	229	35			

Office of the Charitable Institutions, Valletta, 30th March 1867.

J. V. Inglott, Compt[illegible]

No. XIV.

REPORT on CASES of DISEASE at BIRCHIRCARA in May 1865.

(Translation.)

SIR, Valletta, 13th April 1867.

I HAVE to report to you that, with a view of making the necessary inquiries relative to the queries you were pleased to communicate to me, I proceeded yesterday to the village of Birchircara.

From the information I obtained on the subject the following deductions may be made, which I transmit as replies to the above-mentioned queries.

1st Query.—The date at which the diarrhœa first appeared in Birchircara in May 1865.

Dr. P. Mifsud, the police physician of Birchircara, is unable to state with precision the day on which the first case of diarrhœa occurred in the month of May 1865, as no case was reported to him in his capacity of physician to the poor. He recollects to have been called upon to cure very few cases in his private practice, but is unable to point out the date when such cases occurred. I have, however, been informed that Dr. A. Cassar, a medical man practising in the same village, reported on the 20th May 1865 to the syndic of the district two cases of cholera, which occurred on the person of M. A. Psaila, aged 46, living in Strada Vallone, No. 7, and on that of Elena Gafà, aged 80, living in Strada Misida, No. 59. The former woman was attacked on the 17th and the latter on the 20th May. It is necessary to observe that a commission composed of Dr. Hume, late Inspector General of Military Hospitals, Dr. Matthews, Dr. Ghio, and Professor Engerer, appointed by his Excellency the Governor (on the same date of the report made by Dr. Cassar, and consequently on the first day when Elena Gafà was attacked,) declared that no symptoms of Asiatic cholera could be traced out. And I may further state that having yesterday expressly called at the house of Elena Gafà, I obtained correct information, confirmed by two of her sons, one of whom is a respectable person, being a clergyman and a canon, that their mother's case was not Asiatic cholera, as the characteristic symptoms were wanting, and others were not completely developed, and the disease disappeared after a few moments. Consequently it is my opinion that very likely this was a violent case of diarrhœa. The information obtained from the family Gafà is to be relied upon, as its members are very respectable and intelligent and are well informed about the symptoms of Asiatic cholera, as their mother had an attack in the year 1854 which endangered her life. The Gafàs further state that since that attack their mother became subject to bowel complaints very often accompanied by diarrhœa, cramps, and hœmorrhoids.

2nd Query.—The date of the last case or the time at which it ceased.

Dr. Mifsud being unable to answer the first query, it follows that he cannot give any information as regards the second. However, he stated that the last case of diarrhœa which preceded the first attack of Asiatic cholera occurred, not in May, but on the 20th July.

3rd Query.—An estimate of the probable number of cases, and of deaths if any.

In the month of May 1865, except the two cases of M. A. Psaila and Elena Gafà, Dr. Mifsud cannot point out but very few cases observed by him in his private practice; the exact number he cannot state. But from the 1st June to the 20th July he reported 15 cases. These cases, and those reported by Dr. Cassar, were attended with recovery more or less speedy.

4th Query.—An account of the symptoms of the disease.

Dr. Mifsud gives the following symptoms of the cases of diarrhœa as observed by him in his private practice in May and from the 1st June to the 20th of July: Pain and a sensation of heat in the intestines, and diarrhœa.

5th Query.—To what causes it could be distinctly traced.

The cases of diarrhœa which generally occur in the month of May are caused by the sudden changes of temperature, capable of disturbing the cutaneous transpiration, and by the copious drinking of cold water immediately after hard bodily exercise; these causes make a deep impression on the mucous membrane of the stomach. Another cause, very likely, is the eating of early fruit, which is very often unripe

6th Query.—Whether the disease was scattered over the village or only confined to certain parts of it.

The cases observed during the month of May, as well as those which took place between the 1st June and the 20th July, occurred in different parts of the village, and showed no tendency to become localized any where particularly.

7th Query.—What interval of time elapsed between the disappearance of the disease and the first case of Asiatic cholera in the village?

As the cases of diarrhœa continued to occur from the month of May and became more frequent up to the 20th of July, on which day the last case was reported which preceded the first attack of Asiatic cholera in the village, the interval of time elapsed was of three days, as the first attack of cholera took place on the 24th of July (Giuseppe Borg, aged 75, living in Strada Ganu, No. 42). The person who died of cholera in Birchircara on the 18th July cannot be considered as a case which occurred in the village, because the manifestation or the invasion of the disease *took place at Misida*, whence the individual was removed to Casal Birchircara, where he died.

I have, &c.

(Signed) Dr. P. GRILLET,
Police Physician for Valletta.

The Superintendent of Police, Valletta.

No. XV.

EXTRACT from Report addressed by Dr. Aubert-Roche to M. Ferdinand de Lesseps regarding the Epidemic Cholera of 1865.—("Journal de l'Isthme de Suez," No. du 15e Sept. 1865.)

"En Mai 1865 l'épidémie est constaté à Djedda et à le Mecque 150,000 pèlerins y étaient réunis, les cadavres restaient sans sépulture dans les rues.

"Le 19 Mai arrive à Suez le premier navire venant de Djedda, vapeur Anglais, chargé de quinze cents pèlerins, et ayant jeté pendant la traversée des morts à la mer.

"Le 21 Mai des cas de choléra sont constatés à Suez sur le capitaine du navire et sa femme; ils ont été traités par le Dr. Papathodor, médecin de la [redacted]mpagnie.

"Le 22 Mai un cas de choléra est reconnu à [redacted]hour près d'Alexandrie, dans un convoi de [redacted]venant de Suez à Alexandrie, par le Dr. Fibich, médecin de la Compagnie du Canal, et qui se rendit à son poste.

"De 22 Mai au 1er Juin plusieurs milliers de pèlerins ont débarqué à Suez et sont venus camper à Alexandrie, près du Canal de Mahmoudieh.

"Le 2 Juin un premier cas de choléra se manifeste parmi les habitants d'Alexandrie qui demeuraient au milieu des pèlerins.

"Le 5 Juin deux autres cas se déclarent dans les mêmes conditions.

"A partir de ce moment les cas vont en augmentant; jusq'au 12 ils se manifestent dans le même foyer."

No. XVI.

EXTRACTS from the Memorandum by the Police relating to Arrivals from Alexandria in May and June 1865.

"On the 31st May the British steamer "Ephesus" arrived here in five days from Alexandria with 235 hadjis or pilgrims in pratique, of which 61 were landed on the steamer's departure for Tunis the next day. According to the report of the master, three hadjis had died during the passage and were buried at sea—one of mortification, the second of constipation, and the third through senile exhaustion. There was no medical officer on board.

Between the 1st and 9th June seven steamers arrived from Alexandria with 237 passengers, chiefly hadjis.

On the 10th June the British steamer "Olympus" arrived here in four days from Alexandria, one of the crew affected with bowel complaint.

On the 12th June three P. and O. steamers arrived in three days from Alexandria with 268 passengers for England and 28 for Malta.

On the 13th June the British steamer "Alexandra" arrived in five days from Alexandria with six passengers for Malta and three for Liverpool.

On the morning of the 14th June the British steamer "Hellénis" arrived in five days from Alexandria with two passengers for Malta and three for Liverpool.

After the arrival of the above last-mentioned steamer, a telegram was received by Government stating that cholera existed in Egypt, and all vessels coming from Alexandria were from that instant (14th June) subjected to a quarantine of seven full days from their arrival at Malta.

The first vessel thus subjected to the established quarantine was the British steamer "Memnon," which arrived at 5 p.m. of the 14th June in four days from Alexandria with 22 passengers for Malta, of which 11 were hadjis. The master reported that one hadji had died of bowel complaint during the passage, and had been committed to the deep.

The second, the British steamer "Cairo," arrived at 6 p.m. of the 14th June in four days from Alexandria with 47 passengers for Malta, of which 37 were hadjis.

The third, the "Nyanza," P. and O. steamer, arrived at 11 p.m. of the 14th June with seven passengers for Malta.

The fourth, the "Maria Antonietta," Ottoman steamer, arrived on the 17th with one Maltese passenger.

The fifth, the "Assyrien," French steamer, arrived on the 19th with 30 passengers for Malta.

The sixth, the "Rhone," British steamer, arrived on the 20th at 7.30 a.m. with 147 passengers for Malta. The master reported that a passenger and a fireman had died of cholera during the passage.

Thus on the 20th June the number of persons in quarantine at the Lazaretto amounted to 288; viz., 254 passengers, and 34 others in communication with them."

No. XVII.

HISTORY of the earliest Cases of Cholera in Algeria in 1865.

(Extracts from "Rapport sur l'Épidémie de Choléra de 1865 dans la Province d'Alger, A.S. Excellence le Maréchal de Mac-Mahon, Duc de Magenta, Gouverneur-Général de l'Algérie, par Jules Perier, Médecin en chef de la division, etc.)

After having stated that he had directed the medical officers to inform him of the first occurrence of cholera, M. Perier states as follows:—

"Le premier avis parti le 13 Juillet de Dellys nous signalait l'apparition, à peu près simultanée dans la place, de deux cas de choléra sporadique, le premier chez un prisonnier Kabyle venant de Fort-Napoléon, l'autre dans une famille pauvre venant de Bone, par le courrier parti le 9 de cette dernière ville. Cette famille se composait d'un mère et de quatre enfans, tous plus ou moins malades. . . . Le Kabyle entré à l'hôpital le 10, et mort le 11 avec de symptoms de choléra, était atteint depuis longtemps de fièvre intermittente et de diarrhée. . . . Quant à l'aînée des enfants venus de Bone, fille de 14 ans, admise le 10 à l'hôpital pour une diarrhée intense, dont l'invasion remontait à huit jours, et qui avait été prise le 11, de refroidissement général avec faiblesse extrême du pouls, voix éteinte, selles et vomissements bilieux, coliques, crampes vives et taches cyaniques de la face. C'était bien un cas de choléra que l'état sanitaire de Bone non suspect, et celui de Dellys plus que les symptômes eux-mêmes, devraient faire considérer comme devant rester sporadique. . . . Si quelques jours avant mon arrivée M. Messager avait observé en certain nombre des diarrhées ou des dyssenteries avec vomissements quelques fois avec tendence au refroidissement ces affections n'offraient rien d'insolite."

"Deux cas de choléra contractés loin de Médéah venaient de se terminer dans l'hôpital de cette ville, l'un par guérison l'autre par la mort. Le premier était relatif à un domestique Européen employé chez le Caïd Djelali, habitant à 50 kilomètres environ de Médéah, sur la route de Boghar. Cet homme a été transporté le 12 Juillet à l'hôpital, présentant les symptômes suivants: vomissements, selles dyssentériques, sensation de chaleur vive avec refroidissement général, teinte cyanosée, yeux enfoncés, voix éteinte, sub-delirium, faiblesse du pouls, sans crampes. Le second cas se rapportait à un menuisier Européen, âgé de 45 ans, habitant ordinairement l'Arba, où il avait contracté en Juin une fièvre intermittente. Cet homme, après être venu à Médéah pour se traiter dans sa famille, était rentré bien guéri à l'Arba. Il ne tarda pas à rechuter, quitta de nouveau l'Arba pour se rendre à Alger, où il a passé le journée du Dimanche, 23 Juillet; revint ensuite à Médéah, où il arrivait le 24, à cinq heures de soir: à huit heures il entrait à l'hôpital dans l'état suivant; refroidissement général, avec sensation de chaleur intense, sueur froide, cyanose très-prononcée, nez effilé, yeux enfonces, entourés d'un cercle noirâtre, langue humide, légèrement blanchâtre, froide, soif modérée, vomissements de nature glaireuse, légèrement colorés par la bile, ventre retracté, indolore; selles nombreuses bilieuses, crampes doloreuses dans les membres; urines rares; pouls filiforme, à peine perceptible; intelligence parfaite. . . . Son état alla toujours en s'aggravant, et il mourut le 25 à 2 heures de l'après midi."—(Rapport sur l'Épidémie de Choléra de 1865 dans la province d'Alger.)

M. Perier considers the first of these Médéah cases as "une fièvre pernicieuse algide cholériforme," and the second a case of sporadic cholera.

TABLE XVIII.—STATISTICAL RETURN showing the SANITARY CONDITION of DWELLINGS of the CIVIL COSPICUA, during the

Town of

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
28	F.	3 July	Vescovo, 96	Drained	Macadamized.	Good	No	Mezzanine	Indifferent	Crowded.	1	Street
1½	M.	16 August	„ 69	„	Prop.paved	„	„	1st Floor	„	Not crowded	2	„
37	F.	4 September	Manderaggio, 23	„	Bad	Bad	Yes	Mezzanine	Not clean	Crowded	3	Street and terrace.
2 5/12	M.	13 August	„ 27	„	„	„	„	Ground	Indifferent	„	5	Both
80	F.	7 „	„ 63	„	„	„	„	Mezzanine	Not clean	Not crowded	1	Street
81	M.	10 „	„ 68	„	„	„	„	„	„	„	3	Terrace
11	F.	28 „	„ 92	„	„	„	„	3rd Floor	Clean	„	2	Street and terrace.
20	M.	9 September	„ 116	„	„	„	„	Mezzanine	Not clean	„	1	Street
2½	F.	5 August	„ 179	„	„	„	„	2nd Floor	Indifferent	Crowded	2	Yard, terrace
42	M.	6 „	„ „	„	„	„	„	„	„	„	2	„
50	„	26 August	„ 190	„	„	„	„	Basement	Not clean	„	1	Yard
1 7/12	F.	8 July	„ 223	„	„	„	„	Ground Floor	Clean	„	1	Street
29	M.	9 August	„ 220	„	„	„	„	Mezzanine	Indifferent	„	1	„
32	„	22 July	„ 239	„	„	„	„	„	„	„	1	„
75	F.	21 „	„ 245	„	„	„	„	Ground Floor.	Not clean	Not crowded	None	„
31	F.	2 August	„ 246	„	„	„	„	„	Indifferent	Crowded	1	Yard
75	„	14 „	„ 271	„	„	„	„	„	Not clean	Not crowded	1	Street
8	M.	25 „	„ 278	„	„	„	„	Mezzanine	Indifferent	„	2	„
23	F.	15 „	„ 283	„	„	„	„	„	Not clean	„	2	„
7	„	27 July	„ 308 E	„	„	„	„	1st Floor	„	Crowded	1	Terrace
40	„	2 August	„ „	„	„	„	„	„	„	„	1	„
75	M.	14 „	„ 324	„	„	„	„	Ground Floor	„	Not crowded	1	Yard
12	„	11 July	Marsamuscetto, 7	„	Macadamized.	Good	No	1st Floor	Clean	„	2	Yard, corridor
3½	„	16 „	„ 44	„	Prop.paved	„	„	2nd Floor	„	„	1	Yard
52	„	6 September	„ 54	„	Macadamized.	„	Yes	Ground Floor	„	„	None	„
55	„	21 July	„ 58	„	„	„	„	Mezzanine	„	„	1	Street
29	„	4 August	„ 60	„	„	„	„	Ground Floor	„	Crowded	1	„
52	„	31 July	„ 119	„	„	„	„	Basement	Indifferent	Not crowded	1	Mandaraggio
66	F.	16 August	„ 135	„	„	„	„	„	„	„	1	Yard
22	M.	14 July	Mezzodi, 37	„	„	„	„	Ground Floor	Clean	„	2	Street
2 8/12	F.	11 August	Britannica, 42	„	„	Indifferent	„	„	Not clean	Crowded.	None	—
55	M.	12 „	„ 44	„	„	„	„	„ (a stable).	„	„	1	Yard
45	„	22 „	„ 57	„	„	Good	No	Mezzanine	Clean	Not crowded	1	Street
21	„	9 September	„ 58	„	„	„	„	1st Floor	„	„	2	„
2	F.	16 July	„ 61	„	„	„	„	„	„	„	1	Yard
50	M.	23 September	„ 64	„	„	„	„	2nd Floor	„	„	2	„
3	„	25 August	„ 65	„	„	„	Yes	Mezzanine	„	Crowded	2	Street
[illegible]	„	24 „	„ 135	„	„	Indifferent	„	Ground Floor (coach-house).	Not clean	Not crowded	None	—
60	„	18 „	„ 166	„	„	„	„	1st Floor	Clean	„	1	Street
53	„	2 „	St. Giuseppe, 18	„	„	Bad	„	„	„	„	1	„
7	„	5 „	„ 21	„	„	„	„	Mezzanine	„	„	5	Both
[illegible]	F.	7 „	„ 56	„	„	Indifferent	No	„	„	Crowded	1	Street
[illegible]	„	17 July	„ 83	„	„	„	Yes	„	„	Not crowded	1	„
[illegible]		18 „	——	—	—	—	—	—	—	—	—	—
[illegible]		[illegible] August	St. Guiseppe, 105	Drained	Macadamized.	Indifferent	Yes	Mezzanine	Indifferent	Not crowded	2	Street
[illegible]		„	Fontana, 9	„	„	Bad	„	3rd Floor	Not clean	„	1	Yard
[illegible]		„	„ 13	„	„	„	„	Basement	„	„	None	—
[illegible]		„	„ 28	„	„	„	„	Ground Floor	Clean	„	1	Street

POPULATION where DEATHS from CHOLERA occurred in VALETTA, FLORIANA, SENGLEA, VITTORIOSA, and Epidemic of 1865.

Valetta.

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply.					House Drainage.						Remarks.
	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked: or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	
Outer air	Rain and aqueduct.	Good	Sufficient	Drawn from tank.	Under, near house.	Yes	No	Yes	Common privy.	By hand	Yes	—
"	"	Tasted badly.	"	"	Under house	"	"	"	"	"	"	—
"	Aqueduct	Good	"	Carried	Under house, water not used.	"	"	"	"	"	"	—
"	"	"	"	"	No tank	"	Yes	"	Open sink	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Outer air	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"		"	"	"	—
Outer air	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	No	"	"	No privy	—	No	—
Outer air	Rain and aqueduct.	"	"	Tank	Under yard	Yes	No	No	Common privy.	By hand	Occasionally, yes.	—
"	"	Tasted badly.	"	"	"	"	"	"	"	"	"	—
"	"	"	"	Carried	Under room	"	Yes	Yes	"	"	"	—
"	"	Good	"	"	"	"	"	"	Open sink	"	"	—
"	"	"	"	Tank	"	"	"	"	"	"	"	—
Common stair	Aqueduct	"	"	Carried	No tank.	"	"	"	"	"	"	—
"	Rain and aqueduct.	"	"	Tank	Under yard	"	"	"	"	"	"	—
Outer air	"	"	"	"	"	"	No	No	Common privy.	"	Yes	—
"	"	"	"	Carried	No tank	"	"	"	Open sink	"	"	—
"	"	"	"	Tank	Under room	"	"	"	"	"	"	—
"	"	"	"	"	Under house	"	"	"	Common privy.	"	Occasionally, yes.	—
"	"	"	"	"	Under yard	"	"	"	"	By pipe	No	—
"	"	"	"	"	"	"	"	"	Com. privy and sink.	By pipe & by hand.	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	Common privy.	By pipe	No	—
"	"	"	"	"	Under house	"	"	Occasionally, yes.	Open sink	By hand	Occasionally, yes.	—
"	"	"	"	"	Under room	"	Yes	Yes	"	"	Yes	—
"	"	"	"	"	Under yard	"	"	Occasionally, yes.	Common privy.	"	No	—
"	Aqueduct	"	"	Carried	Under house (empty).	"	No	Yes	Open sink	"	Occasionally, yes.	—
"	"	"	"	"	Under house	"	"	"	"	"	"	—
"	"	"	"	"	No tank	"	Yes	"	"	"	"	—
"	Rain and aqueduct.	"	"	Tank	Under house	"	"	"	"	"	"	—
—	—	—	—	—	—	—	—	—	—	—	—	—
Outer air	Rain and aqueduct.	Good	Sufficient	Tank	Under house	Yes	Yes	Yes	Open sink	By hand	Occasionally, yes.	—
—	Aqueduct	"	"	Carried	Under inlet (empty).	"	No	No	"	"	No	—
Outer air	"	"	"	"	None	No	Yes	Yes	None	—	"	—
"	"	"	"	"	"	Yes	"	"	Open sink	By hand	Yes	—

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths from

Town of

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or both."
Yrs.		1865.										
7	F.	6 August	—	—	—	—	—	—	—	—	—	—
45	M.	7 „	Fontana, 44	Drained	Macadamized.	Bad	Yes	1st Floor	Clean	Crowded	1	Street
15	„	7 „	—	—	—	—	—	—	—	—	—	—
56	F.	3 „	Reale, 27	Drained	Macadamized.	Good	Yes	Ground Floor	Not clean	Crowded	1	Yard
40	M.	10 „	„ „	„	„	„	„	3rd Floor	Clean	„	1	„
6	F.	13 „	„ „	„	„	„	„	„	„	Not crowded	1	„
31	„	15 „	„ „	„	„	„	„	„	„	„	1	„
29	M.	20 July	„ 94	„	„	„	No	1st Floor	„	„	1	Street
32	„	20 „	„ „	„	„	„	„	„	„	„	1	„
3	„	21 „	„ „	„	„	„	„	„	„	„	1	„
54	F.	22 „	„ 217	„	„	„	„	Ground Floor	„	Crowded	2	Both
15	„	26 „	„ „	„	„	„	„	„	„	„	2	„
23	M.	25 „	„ 94	„	„	„	„	„	„	Not crowded	1	Yard
12	F.	7 August	„ 95	„	„	„	„	2nd Floor	„	„	3	Street
33	„	16 „	„ 168	„	„	„	Yes	Ground Floor	„	„	1	Yard
5	M.	29 „	„ 171	„	„	„	„	Mezzanine	„	„	2	Street, terrace
28	F.	13 „	„ 189	„	„	„	„	„	Not clean	„	3	Street
2	M.	11 „	„ 197	„	„	„	„	1st Floor	Clean	„	2	Stair
70	F.	16 „	„ „	„	„	„	„	„	„	„	1	Yard
3	„	2 „	„ 230	„	„	„	„	„	„	„	3	„
73	„	14 „	„ „	„	„	„	„	Ground Floor	Not clean	„	3	„
4	„	3 „	Mercanti, 12	„	„	„	„	„	„	Crowded	1	„
50	„	18 „	„ „	„	„	„	„	2nd Floor	Clean	Not crowded	2	„
37	„	22 „	„ „	„	„	„	„	1st Floor	„	„	2 doors	Yard and stair
23	M.	14 „	„ „	„	„	„	„	Basement	Not clean	„	None	—
56	F.	15 September	„ 113	„	Properly paved.	„	„	Mezzanine	Clean	„	1	Street
38	M.	20 „	„ 114	„	„	„	„	1st Floor	„	„	2	Yard
38	F.	20 July	„ 134	„	Macadamized.	„	No	Mezzanine	„	„	4	Both
53	M.	22 „	„ „	„	„	„	„	„	„	„	4	„
42	F.	28 August	„ 143	„	„	„	Yes	„	„	„	1	Street
48	„	31 „	„ 166	„	„	„	„	„	„	„	2	„
50	„	28 September	St. Ursola, 6	„	„	„	„	1st Floor	„	„	2	Both
50	„	21 July	„ 79	„	„	„	„	Ground Floor	„	„	1	Yard
48	„	29 „	„ 150	„	„	Indifferent	„	4th Floor	„	„	2	Street
30	M.	7 October	„ „	„	„	„	„	3rd Floor	„	„	1	Yard
26	„	13 September	„ 155	„	„	„	„	Mezzanine	„	„	1	Street
15	F.	29 July	„ 158	„	„	„	„	Ground Floor	Indifferent	„	2	„
5	„	29 „	„ „	„	„	„	„	„	„	„	2	„
22	„	14 August	„ 181	„	„	„	„	Mezzanine	Clean	„	2	„
49	„	22 „	„ „	„	„	„	„	„	„	„	2	„
66	„	18 September	„ 191b	„	„	„	No	„	„	„	1	„
77	M.	20 „	„ „	„	„	„	—	„	„	„	1	„
75	F.	23 „	„ „	„	„	„	—	„	„	„	1	„
[illegible]	„	22 August	„ 201	„	„	„	Yes	—	Indifferent	Crowded	1	Yard
[illegible]	„	25 „	Levante, 64	„	Properly paved.	Good	„	1st Floor	Clean	Not crowded	1	Street
[illegible]	„	24 „	„ „	„	„	„	„	„	„	„	1	„
[illegible]	„	[illegible] July	„ 69	„	„	„	No	Mezzanine	„	„	2	„
[illegible]	„	[illegible]ptember	„ 70	„	„	„	Yes	Ground Floor	Indifferent	„	None	„
[illegible]	„	[illegible]	„ 87	„	„	„	„	Mezzanine	Clean	„	1	„
[illegible]	„	[illegible]	Tramontana, 11	„	Macadamized.	Indifferent	„	2nd Floor	„	Not crowded	2	Passage and stair.

Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Valetta—continued.

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply. Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	House Drainage. Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked: or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand" "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
—	—	—	—	—	—	—	—	—	—	—	—	—
Common stair	Aqueduct	Good	Sufficient	Carried	None	Yes	Yes	Yes	Open sink	By hand	Yes	—
—	—	—	—	—	—	—	—	—	—	—	—	—
Common stair	Rain and aqueduct.	Good	Sufficient	Tank	Under inlet	Yes	Yes	Yes	Open sink	By hand	Yes	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,		,,	,,	,,	—
Outer air	,,	,,	,,	,,	Under yard	,,	No	No	,,	,,	Occasionally, yes.	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	Carried	None	,,	,,	Yes	,,	,,	Yes	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	Tank	Under yard	,,	,,	No	,,	,,	Occasionally, yes.	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	No	—
Common stair	,,	,,	,,	,,	Under house	,,	Yes	Yes	,,	,,	Yes	—
Outer air	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Common stair	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	Under yard	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
—	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	Died at Rabato of Notabile.
Outer air	,,	,,	,,	,,	Under house	,,	No	No	,,	,,	Occasionally, yes.	—
Common stair	,,	,,	,,	,,	Under yard	,,	Yes	Yes	,,	,,	Yes	—
Outer air	,,	,,	,,	,,	,,	,,	No	No	,,	,,	Occasionally, yes.	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	Carried	Under house (not used).	,,	Yes	Yes	,,	,,	Yes	—
,,	Aqueduct	,,	,,	Tank	Under house	,,	,,	,,	,,	,,	,,	—
,,	Rain	,,	,,	,,	Under yard	,,	,,	,,	Common privy.	,,	,,	—
—	Rain and aqueduct.	,,	,,	,,	—	,,	No	No	Open sink	,,	,,	—
Common stair	Aqueduct	,,	,,	Carried	—	,,	Yes	Yes	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Outer air	Rain and aqueduct.	,,	,,	Tank	Under house	,,	No	No	,,	,,	,,	—
,,	Aqueduct	,,	,,	Carried	None	,,	Yes	Yes	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	Rain and aqueduct.	,,	,,	Tank	Under house	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	Aqueduct	Muddy	,,	,,	,,	,,	No	No	,,	,,	No	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Common stair	Rain and aqueduct.	Good	,,	Carried	—	,,	Yes	Yes	,,	,,	,,	—
,,	Aqueduct	,,	,,	,,	None	,,	,,	,,	,,	,,	Yes	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Outer air	,,	,,	,,	,,	Tank under house, empty.	,,	No	No	,,	,,	No	—
,,	Rain and aqueduct.	,,	,,	Tank	Under room	,,	Yes	Yes	,,	,,	Yes	—
,,	,,	,,	,,	,,	Under house	,,	No	No	,,	,,	No	—
Common stair	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths

Town of

Fatal Cases of Cholera.										Windows.	
Age.	Sex.	Date of Death.	Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs. 11	F.	1865. 11 August	Tramontana, 12	Drained	Macadamized.	Indifferent	Yes	1st Floor	Clean	Not crowded	2	Street
60	M.	15 „	„ „	„	„	„	„	„	„	„	2	„
50	„	13 „	„ 13	„	„	„	„	2nd Floor	Indifferent	„	1	Yard
30	„	2 „	„ 32	„	Prpoperly paved.	„	„	Mezzanine	Clean	„	1	Street
34	F.	23 July	„ 43	„	Macadamized.	„	„	Ground Floor	Indifferent	„	1	„
35	M.	26 „	„ „	„	„	„	„	„	„	„	1	„
98	F.	12 August	„ 82	„	„	Good	No	Mezzanine	Clean	„	2	„
37	„	24 „	Stretta, 3	„	Properly paved.	Indifferent	Yes	„	„	„	1	„
60	M.	23 July	„ 15	„	„	Good	—	—	—	—	—	—
62	F.	5 September	„ 55	„	„	Indifferent	Yes	2nd Floor	Clean	Not crowded	1	Yard
49	M.	16 August	„ 100 T	„	„	„	No	Ground Floor	Not clean	„	1	Stair
60	F.	27 „	„ 103	„	„	„	Yes	2nd Floor	Clean	„	1	Street
52	„	12 „	„ 117	„	„	„	„	Ground Floor	Not clean	Crowded	1	Yard
80	„	13 „	„ 122	„	„	„	„	1st Floor	Clean	Not crowded	1	Street
70	„	23 „	„ 176	„	„	„	„	Mezzanine	Indifferent	„	2	„
55	„	19 September	„ 192 D	„	„	„	No	3rd Floor	Clean	„	1	Yard
20	M.	25 July	Fianco, 10	„	Bad	Bad	Yes	Ground Floor (a stable).	Not clean	„	1	Street
10	„	25 „	„ 42	„	„	„	„	Ground Floor	„	Crowded	2	„
[illegible]	F.	19 August	St. Paolo, 61	„	Properly paved.	Good	No	2nd Floor	Clean	Not crowded	2	„
[illegible]		2 September	„ 164	„	Macadamized.	Indifferent	„	Ground Floor	Indifferent	„	2	„
[illegible]	M.	18 August	„ 189	„	„	„	Yes	2nd Floor	„	Crowded	1	Yard
32	„	2 „	„ 194	„	„	„	No	„	Clean	Not crowded	2	„
28	F.	17 „	„ 236	„	„	Good	„	„	„	„	2	Staircase and yard.
3	„	24 September	„ 317	„	„	„	„	Ground Floor	Not clean	„	1	Street
65	M.	25 July	„ 318	„	„	„	„	2nd Floor	Clean	„	2	Yard and terrace.
20	„	25 „	San Giovanni, 23	„	Properly paved.	„	„	Mezzanine	„	„	2	Street
30	F.	7 August	„ 46	„	Macadamized.	„	„	Terrace	„	„	2	Street, terrace
32	M.	13 „	„ 263 D	„	Properly paved.	„	Yes	Ground Floor	„	Crowded	3	Street
42	„	16 „	„ „	„	„	„	„	„	„	„	3	„
10	„	12 „	Toro, 6	„	„	Bad	„	Mezzanine	„	Not crowded	2	„
12	F.	4 „	„ 18	„	„	„	No	Oven	Not clean	„	Did not sleep in the same place.	—
19	„	5 „	„ 20	„	„	„	„	Mezzanine (oven).	Indifferent	„	1	Yard
19	M.	26 July	„ 22	„	„	„	„	Ground Floor	Not clean	„	1	„
40	F.	5 August	„ „	„	„	„	„	„	„	„	1	„
10	„	29 July	„ 24	„	„	„	„	Mezzanine (oven).	Indifferent	„	1	„
76	„	29 „	„ 36	„	„	„	„	2nd Floor	Clean	„	1	Street
23	M.	26 „	San Carlo, 3	„	„	„	Yes	Ground Floor (oven).	Not clean	„	2	„
2	„	26 „	„ 8	„	„	„	„	„	„	„	2	Both
52	„	26 „	„ 10	„	„	„	„	„	„	„	1	Yard
8	„	3 August	„ 13	„	„	Indifferent	„	2nd Floor	Clean	„	2	Street
2	„	2 „	„ 15	„	„	„	„	„	„	„	2	„
F.		30 July	„ 24	„	„	Bad	„	Mezzanine	„	„	3	„
		1 August	„ 25	„	„	„	„	Ground Floor	Indifferent	„	1	„
		1 „	„ 26	„	„	„	„	1st Floor	„	„	1	„
		July	„ 28	„	„	„	„	Ground Floor	Clean	„	2	„
		ust	„ 32	„	„	„	No	Mezzanine	Not clean	Crowded	2	„
			Cristoforo, 7	„	Macadamized.	Good	„	„	Clean	Not crowded	1	„

from Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Valetta—continued.

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room" or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Aqueduct	Good	Sufficient	Tank	Under house	Yes	Yes	Yes	Open sink	By hand	Yes	—
„	„	„	„	„	„	„	„	„	„	„	„	—
Common stair	Rain and aqueduct.	„	„	Carried	„	„	„	...	„	„	„	—
Outer air	„	„	„	Tank	„	„	„	„	„	„	„	—
„	„	Tasted badly.	„	„	Under room	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	„	Good	„	„	Under house	„	No	No	Trapped privy.	„	No	—
„	„	„	„	„	„	„	„	Yes	Open sink	„	Yes	—
—	—	—	—	—	—	—	—	—	—	—	—	—
Outer air	Rain and aqueduct.	Good	Sufficient	Tank	Under house	Yes	Yes	Yes	Open sink	By hand	No	—
„	„	„	„	„	„	No	No	No	—	—	„	—
Common stair	—	„	„	Carried	—	Yes	Yes	Yes	Open sink	By hand	Yes	—
„	—	„	„	„	—	„	„	„	„	„	„	—
Outer air	Rain and aqueduct.	„	„	Tank	Under yard	„	No	No	Trapped Privies.	„	No	—
„	Aqueduct	„	„	„	Under house	„	„	Yes	Open sink	„	Yes	—
Common stair	„	„	„	Carried	None	„	„	No	„	„	No	—
Outer air	Rain and aqueduct.	„	„	„	„	No	Yes	Yes	—	—	„	—
„	„	„	„	„	No tank	Yes	„	„	Open sink	By hand	Yes	—
„	„	„	„	Tank	Entrance	„	No	No	Common privy (trapped).	„	No	—
„	„	„	„	„	Under room	„	—	Yes	Open sink	„	Yes	—
Common stairs	Aqueduct	„	„	Carried	—	„	Yes	„	„	„	„	—
„	Rain and aqueduct.	„	„	Tank	Under house	„	No	No	„	„	No	—
Outer air	„	„	„	„	Under yard	„	„	„	Common privy (trapped).	„	„	—
„	„	„	„	„	„	„	„	„	Common privy	„	„	—
„	„	„	„	„	„	„	„	„	Open sink	„	Occasionally yes.	—
„	Rain	„	„	„	Under house	„	„	„	Common privy (trapped).	„	No	—
„	Aqueduct	„	„	Carried	„	„	„	„	„	„	„	—
—	„	„	„	„	—	„	Yes	Yes	Open sink	„	Yes	—
—	„	„	„	„	—	„	„	„	„	„	„	—
Outer air	Rain and aqueduct.	„	„	Tank	Under house	„	„	„	„	„	„	—
„	Aqueduct	„	„	Carried	Under house (not used).	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	None	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	Rain and aqueduct.	Tasted badly.	„	Tank	Under house	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	Under room	„	„	„	„	„	„	—
„	„	„	„	„	Under house	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	Aqueduct	Good	„	Carried	None	No	No	No	—	—	No	—
„	„	„	„	„	„	„	—	—	—	—	„	—
„	Rain and aqueduct.	„	„	Tank	Under house	Yes	Yes	Yes	Open sink	By hand	Yes	—
„	„	„	„	„	„	„	„	„	„	„	„	—
Common stairs	„	„	„	„	Under yard	„	„	No	„	„	No	—
Outer air	„	„	„	Carried	Under room (not used).	„	„	Yes	„	„	Yes	—
„	Aqueduct	„	„	„	None	„	—	„	„	„	„	—
„	Rain and aqueduct.	„	„	Tank	Under house	„	No	No	„	„	No	—

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths

Town of

Fatal Cases of Cholera.										Windows.	
Age.	Sex.	Date of Death.	Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	State No. in affected Room.	State whether the Windows open into a "Street" "Court" or "both."
Yrs. 45	F.	1865. 10 September	Cristoforo, 35	Drained	Macadamized.	Good	No	Mezzanine	Clean	Not crowded	1	Street
1¼	M.	27 July	„ 64	„	Paved	„	„	„	„	„	1	„
21	F.	31 „	„ 64	„	„	„	„	„	„	„	1	„
3½	M.	3 August	„ 75	„	Macadamized.	Indifferent	—	„	„	„	1	„
14	F.	4 „	„ 75	„	„	„	—	„	„	„	1	„
43	„	20 „	„ 84	„	„	Good	Yes	1st Floor	„	„	1	Yard
30	„	30 July	„ 87	„	„	„	„	2nd Floor	„	„	1	Street
70	„	2 August	„ 87	„	„	„	„	Ground Floor	Indifferent	„	1	Yard
33	„	5 „	„ 89	„	„	„	„	1st Floor	Clean	„	None	—
55	„	13 „	„ 89	„	„	„	„	Ground Floor	„	„	1	Passage
70	„	14 „	„ 89	„	„	„	„	1st Floor	„	„	2	Both
9	M.	26 July	„ 114	„	„	„	No	Terrace	„	„	3	Terrace
1 10/12	F.	1 August	„ 124	„	„	Indifferent	Yes	2nd Floor	„	„	1	Yard
38	M.	7 „	„ 126	„	Properly paved.	Bad	„	3rd Floor	„	„	1	Street
15	F.	11 „	Aquila, 7	„	„	„	„	Mezzanine	Not clean	„	2	„
48	„	1 „	„ 8	„	„	„	„	2nd Floor	Clean	„	1	Yard
56	„	27 July	„ 9	„	„	„	„	Mezzanine	Indifferent	„	1	Street
75	M.	20 September	„ 11	„	„	„	„	Ground Floor	Clean	Crowded	2	Both
25	„	28 July	Frederico, 19	„	„	Good	„	Mezzanine	Indifferent	„	1	Yard
50	F.	August	„ 26	„	„	„	No	„	Not clean	Not crowded	1	Street
14	M.	9 July	Molini, (?)	Undrained	Macadamized.	„	Yes	Ground Floor	Indifferent	Crowded	1	„
7	F.	8 August	Regina, 15	Drained	Indifferent	Indifferent	No	Mezzanine	„	Not crowded	2	Both
40	„	30 July	„ 31	„	Bad	Bad	Yes	Ground Floor	Clean	Crowded	2	„
66	M.	27 August	„ 34	„	„	„	„	„	„	„	2	„
37	F.	21 „	„ 39	„	„	„	„	1st Floor	„	Not crowded	4	Yard and terrace.
⅔	M.	22 „	„ 39	„	„	„	„	2nd Floor	Indifferent	„	3	„
4	„	23 „	„ 42	„	„	„	„	„	„	„	1	Street
23	„	30 July	„ 49	„	„	„	„	1st Floor	„	„	1	„
75	„	14 August	San Nicola, 1	„	Properly paved.	Good	„	3rd Floor	Clean	„	2	„
36	F.	29 „	„ „	„	„	„	„	2nd Floor	„	„	1	„
50	„	6 „	„ 3	„	„	„	„	Mezzanine	„	„	3	„
41	„	19 „	„ 22	„	Macadamized.	Indifferent	No	„	„	„	3	„
7	M.	30 July	„ 77	„	„	Good	Yes	2nd Floor	Not clean	Crowded	2	Both
42	F.	3 August	„ „	„	„	„	„	„	Clean	Not crowded	3	Street
5	M.	26 „	„ 116	„	„	Indifferent	„	Ground Floor	„	„	1	Yard
60	„	29 „	„ „	„	„	„	„	1st Floor	„	„	2	Both
48	F.	30 „	„ „	„	„	„	„	2nd Floor	„	Crowded	1	Yard
50	„	3 September	„ „	„	„	„	„	3rd Floor	„	Not crowded	1	„
60	„	8 August	„ 127	„	„	„	„	1st Floor	„	„	1	„
69	„	16 „	„ „	„	„	„	„	Terrace	„	„	1	„
50	„	18 „	„ 139	„	„	„	„	Basement	Not clean	„	1	„
38	„	27 „	San Domenico, 2	„	„	„	„	Ground Floor	Indifferent	Crowded	1	Street
41	M.	30 July	„ 90	„	Properly paved.	„	„	2nd Floor	Clean	Not crowded	1	Yard
[illegible]	F.	8 August	„ 103	„	„	„	„	Ground Floor	Not clean	Crowded	1	Street
[illegible]	„	12 „	„ „	„	„	„	„	1st Floor	Clean	Not crowded	2	„
[illegible]	„	3 „	„ „	„	„	„	„	Terrace	„	„	1	„
[illegible]	„	[illegible] „	„ 142	„	Macadamized.	„	„	2nd Floor	„	„	1	Yard
[illegible]	„	[illegible]ptember	„ „	„	„	„	„	3rd Floor	„	„	1	„
[illegible]	„	[illegible]	„ „	„	„	„	„	„	„	„	1	„
[illegible]	„	[illegible]	„ 176	„	„	„	—	—	—	—	—	—

from Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Valetta—continued.

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply. Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	House Drainage. Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Rain and aqueduct.	Good	Sufficient	Tank	Under house	No	No	No	—	—	No	
"	"	"	"	"	"	Yes	"	"	Both	By pipe and by hand.	"	
"	"	"	"	"	"	"	"	"	"	"	"	
"	Aqueduct	"	"	Carried	Under house (not used).	"	"	Occasionally, yes.	Open sink	By hand	Occasionally, yes.	
"	"	"	"	"	—	"	"	"	"	"	"	
"	Rain and aqueduct.	Muddy	"	Tank	Under inlet	"	"	Yes	"	"	"	
Common stairs	Aqueduct	Good	"	Carried	" (not used).	"	"	"	"	"	"	
"	"	"	"	"	"	"	"	"	"	"	"	
—	—	—	—	—	—	—	—	—	—	—	—	
Common stairs	Aqueduct	Good	Sufficient	Carried	Under house (not used).	Yes	No	Yes	Open sink	By hand	Yes	
—	—	—	—	—	—	—	—	—	—	—	—	
Common stairs	Rain and aqueduct.	Muddy	Sufficient	Tank	Under house	Yes	No	No	Open sink	By hand	No	
"	"	Good	"	"	Under yard	"	"	"	"	"	Occasionally, yes.	
"	"	"	"	"	Under house	"	"	Yes	"	"	Yes	
Outer air	Aqueduct	"	"	"	"	"	Yes	"	"	"	"	
Common stairs	"	"	"	"	"	"	"	"	"	"	"	
Outer air	"	"	"	"	"	"	"	"	"	"	"	
Common stairs	Rain and aqueduct.	Tasted badly.	"	"	"	"	"	"	"	"	"	
Outer air	"	Good	"	"	Under yard	"	"	"	"	"	"	
"	"	"	"	"	Under house	"	"	"	"	"	"	
"	Aqueduct	"	"	Carried	"	"	No	"	—	No privy	No	
"	"	"	"	"	No tank	No	Yes	No	Open sink	By hand	Yes	
"	"	"	"	"	Under house (empty).	Yes	No	Yes	"	"	"	
"	"	"	"	"	Under passages (empty).	"	—	"	"	"	"	
Common stairs	"	"	"	"	Under house (empty).	"	No	"	"	"	"	
"	"	"	"	"	"	"	"	"	"	"	"	
Outer air	"	"	"	"	"	"	"	"	"	"	"	
Common stairs	"	"	"	"	"	"	"	"	"	"	"	
"	Rain and aqueduct.	"	"	Tank	Under house	"	Yes	"	"	"	"	
"	"	"	"	"	"	"	"	"	"	"	"	
Outer air	"	"	"	Carried	No tank	"	"	"	"	"	"	
"	"	"	"	"	Under house	"	"	"	"	"	"	
Common stair	Aqueduct	"	"	"	"	"	"	"	"	"	"	
"	"	"	"	"	"	"	"	"	"	"	"	
"	Rain and aqueduct.	"	"	Tank	"	"	"	"	"	"	"	
"	"	"	"	"	"	"	"	"	"	"	"	
"	"	"	"	"	"	"	"	"	"	"	"	
"	"	"	"	"	"	"	"	"	"	"	"	
"	Aqueduct	"	"	Carried	" (empty)	"	"	"	"	"	"	
"	"	"	"	"	"	"	"	"	"	"	"	
"	Rain and aqueduct.	"	"	Tank	Under yard	"	"	"	"	"	"	
Outer air	Aqueduct	"	"	Carried	Under adjoining house.	"	"	"	"	"	"	
"	Rain and aqueduct.	"	"	Tank	"	"	"	"	Trapped privy.	"	"	
Common stair	"	"	"	Carried	No tank	"	—	"	"	"	"	
"	"	"	"	"	"	"	—	"	"	"	"	
"	"	"	"	"	"	"	No	No	"	"	Occasionally, yes.	
"	"	"	"	"	Under house	"	Yes	Yes	"	"	Yes	
"	"	"	"	"	"	"	—	"	"	"	"	
"	"	"	"	"	"	"	—	"	"	"	"	
—	—	—	—	—	—	—	—	—	—	—	—	

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths

Town of

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
53	M.	30 July	Marina, 57	Drained	Bad	Bad	—	Mezzanine	Not clean	Crowded	2	Yard and Great Harbour.
2	F.	7 August	„ 58	„	Properly paved.	House kept dirty.	No	1st Floor	Clean	Not crowded	1	Terrace
45	M.	24 „	„ 88	„	Macadamized.	Good	„	Mezzanine	„	„	5	Street garden
3	„	31 July	Ospedale, 8	„	„	Bad	Yes	2nd Floor	„	„	1	Yard
6	F.	30 August	„ 12	„	„	„	„	1st Floor	„	„	1	Street
50	„	4 September	„ 17	„	„	Indifferent	No	Mezzanine	„	„	2	„
16	„	9 „	„ 20	„	„	Good	„	3rd Floor	„	„	1	„
6	F.	29 August	„ 27	„	„	„	„	Ground Floor	„	„	2	Street and yard
50	M.	2 „	„ 33	„	„	Indifferent	Yes	„	Not clean	„	2	Yard
24	„	25 „	„ „	„	„	„	„	„	„	„	2	„
11	„	10 „	„ 39	„	„	„	„	1st Floor	Clean	„	2	Street
1 7/12	„	8 „	„ 67	„	„	„	Occasionally, yes.	Ground Floor	Not clean	„	2	„
60	F.	5 „	„ 88	„	„	„	Yes	Mezzanine	Clean	„	1	„
29	M.	6 „	Pozzi, 17	„	„	Bad	—	3rd Floor	„	„	1	Yard
60	F.	5 „	„ 20	„	„	„	Yes	2nd Floor	„	„	2	Street
5	M.	31 July	„ 25	„	„	„	„	1st Floor	Indifferent	Crowded	1	„
22	„	1 August	„ 34	„	„	„	„	„	Clean	Not crowded	2	Yard
[illegible]	F.	29 „	„ 40	„	Properly paved.	„	„	„	„	„	1	Street
[illegible]	M.	10 September	„ 61	„	„	„	„	Ground Floor	„	„	1	„
46	F.	25 August	Forni, 11	„	Macadamized.	Good	—	2nd Floor	„	„	1	„
1 1/2	„	19 „	„ 17	„	„	„	No	Mezzanine	„	„	1	„
40	„	3 „	„ 24	„	„	„	„	2nd Floor	„	„	1	„
37	„	10 „	„ 29	„	„	„	„	Mezzanine	„	„	1	Yard
2 1/2	„	13 „	„ „	„	„	„	„	„	„	„	1	„
16	M.	12 September	„ 59	„	„	„	Yes	2nd Floor	„	„	1	„
80	F.	4 August	„ 96	„	„	„	No	Ground Floor	„	„	2	Street
21	M.	12 „	„ 99 D	„	„	„	„	„	„	„	1	„
55	F.	20 September	„ 99	„	„	„	Yes	Mezzanine	„	„	1	„
12	„	27 August	„ 102 D	„	„	„	No	„	„	„	1	„
60	M.	21 „	„ 150	„	„	„	„	Ground Floor	„	„	—	—
55	„	3 „	San Marco, 41	„	„	Indifferent	„	Mezzanine	Not clean	„	4	Street and terrace.
55	„	16 September	„ 59	„	Properly paved.	„	Yes	„	Clean	„	2	Street
60	„	11 „	Zecca, 33 D	„	Macadamized.	„	No	„	Indifferent	Crowded	2	„
17	„	14 „	„ 34	„	„	„	„	3rd Floor	Clean	Not crowded	1	„
18	F.	4 August.	„ 70 D	„	„	Good	Yes	Mezzanine	„	„	1	„
29	M.	„ „	„ „	„	„	„	„	„	„	„	1	„
1 1/2	„	5 „	„ 70 D	„	„	„	„	„	„	„	1	„
37	„	27 „	„ 78	„	„	„	„	2nd Floor	„	„	1	Yard
65	F.	28 „	„ 80	„	„	„	„	3rd Floor	„	„	1	„
52	M.	11 „	„ 101	„	„	„	„	4th Floor	„	„	3	„
[illegible]0	F.	12 „	„ „	„	„	„	„	„	„	Crowded	1	„
[illegible]8	„	17 September	„ 118 D	„	„	„	No	Ground Floor	Indifferent, damp.	No	1	Street
[illegible]6	M.	13 August	„ 170	„	Indifferent	„	Yes	„	Not clean	Not crowded	1	„
33	F.	25 „	Ponente, 2	„	Paved with lavas.	„	„	3rd Floor	Clean	„	3	Yard and stair
[illegible]	„	5 „	„ 61	„	Macadamized.	„	No	1st Floor	„	„	3	Street
[illegible]	[illegible]	15 „	„ „	„	„	„	„	2nd Floor	„	„	1	Yard
[illegible]	[illegible]	6 „	St Anna, 8	„	Paved	Bad	Yes	Ground Floor	Not clean	Crowded	2	„
[illegible]	[illegible]	„	„ „	„	„	„	„	„	„	„	2	„
[illegible]	[illegible]	„	„ 49	„	„	„	„	„	Clean	Not crowded	1	Street
[illegible]	[illegible]	„	St. Patrizio, 10	„	Macadamized.	Indifferent	„	2nd Floor	„	„	3	Both

from Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Valetta—continued.

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply.					House Drainage.						Remarks.
	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	
Outer air	Aqueduct	Goo	Sufficient	Carried	No tank	Yes	Yes	Yes	Open sink	By hand	Yes	—
Common stair	,,	,,	,,	,,	,,	,,	No	No	,,	,,	No	—
Outer air	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Common stair	,,	,,	,,	,,	Under house (empty)	,,	,,	Occasionally, yes.	,,	,,	Occasionally, yes.	—
Outer air	,,	,,	,,	,,	No tank)	,,	,,	Yes	,,	,,	Yes	—
,,	Rain and aqueduct.	,,	,,	Tank	Under house	,,	—	,,	,,	,,	,,	—
Common stair	,,	,,	,,	,,	,,	,,	No	No	Com. privy (trapped).	,,	No	—
Outer air	,,	,,	,,	,,	,,	,,	,,	Yes	Open sinks	,,	Yes	—
Common stair	Aqueduct	,,	,,	,,	Under house (empty).	,,	,,	,,	,,	,,	,,	They slept in the yard.
,,	,,	,,	,,	—	,,	,,	,,	,,	,,	,,	,,	
,,	,,	,,	,,	Carried	,,	,,	—	,,	,,	,,	,,	—
Outer air	,,	,,	,,	,,	No tank	,,	No	No	,,	,,	,,	—
,,	Rain and aqueduct.	,,	,,	Tank	Under house	,,	,,	Yes	,,	,,	,,	—
Common stair	Aqueduct	,,	,,	Carried	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	No tank	,,	Yes	,,	,,	,,	,,	—
,,	,,		,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Outer air	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	Rain and aqueduct.	,,	,,	Tank	Under house	,,	,,	No	Trapped privy.	,,	Occasionally, yes.	—
,,	Aqueduct	,,	,,	Carried	Under house (empty).	,,	—	Yes	Open sinks	,,	Yes	—
,,	Rain and aqueduct.	,,	,,	Tank	Under house	,,	Yes	No	Common privy.	,,	No	—
,,	Rain	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,		,,	,,	—
,,	Rain and aqueduct.	,,	,,	,,	,,	,,	,,	Yes		,,	Occasionally, yes.	—
,,	Aqueduct	,,	,,	Carried	,,	,,	,,	,,	Open sink	,,	Yes	—
,,	,,	,,	,,	,,	No tank	,,	No	No	—	,,	No	—
,,	Rain and aqueduct.	Tasted badly.	,,	Tank	Under house	,,	,,	Yes	Trapped privy.	,,	Yes	—
,,	Rain	Good	,,	,,	,,	,,	,,	No	Open sink	,,	No	—
—	Rain and aqueduct.	,,	,,	,,	Under yard	,,	,,	,,	—	—	—	—
Outer air	,,	,,	,,	Carried	—	,,	Yes	Occasionally, yes.	Open sink	By hand	Occasionally, yes.	—
,,	,,	,,	,,	Tank	Under house	,,	No	No	Common privy.	,,	Yes	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Open sink	,,	No	—
,,	Aqueduct	,,	,,	Carried	,,	,,	,,	Yes	,,	,,	Yes	—
,,	Rain and aqueduct.	,,	,,	Tank	,,	,,	Yes	,,	Common privy.	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Common stair	,,	,,	,,	,,	Under yard	,,	,,	No	,,	,,	No	—
Outer air	,,	,,	,,	,,	,,	,,	,,	Yes	Both	,,	Yes	—
Common stair	,,	,,	,,	,,	,,	,,	,,	,,	Open sink	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Outer air	,,	,,	,,	,,	Under house	,,	No	No	Com. privy (trapped).	,,	No	—
,,	Rain	,,	,,	Carried	No tank	No	,,	,,	None	—	,,	—
Common stair	Rain and aqueduct.	,,	,,	Tank	Under house	Yes	Yes	Yes	Common privy.	—	,,	—
,,	,,	Bad	,,	,,	,,	,,	,,	,,	Both	By hand	Yes	—
,,	,,	Tasted badly.	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	Rain	Good	,,	,,	Under room	,,	,,	,,	Open sink	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Outer air	Aqueduct	,,	,,	Carried	No tank	,,	,,	,,	,,	,,	,,	—
Common stair	Rain and aqueduct.	,,	,,	Tank	Under house	,,	,,	,,	Common privy.	,,		—

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths

Town of

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs. 50	F.	1865. 6 August	St. Patrizio, 14	Drained	Macadamized.	Indifferent	Yes	Ground Floor	Clean	Not crowded	1	Into mandeerazzio.
75	M.	15 „	„ „	„	„	„	„	„	„	„	1	„
8	„	18 September	„ 52	„	„	„	„	3rd Floor	„	Crowded	1	Street
24	F.	22 „	„ „	„	„	„	„	„	„	„	1	„
36	M.	25 „	„ „	„	„	„	„	„	„	„	1	„
60	F.	15 „	„ 63	„	„	„	No	2nd Floor	„	Not crowded	2	„
3	M.	15 „	„ „	„	„	„	„	Ground Floor	„	Crowded	None	—
5	„	17 „	„ „	„	„	„	„	„	„	„	„	—
10	F.	19 „	„ 2	„	„	„	„	Mezzanine	„	„	1	Yard
30	„	25 „	„ „	„	„	„	„	2nd Floor	„	Not crowded	2	Street
2 7/12	„	17 „	„ „	„	„	„	„	1st Floor	Indifferent	„	2	Yard
4	M.	29 August	Scaloni, 15	„	Properly paved.	Bad	Yes	Mezzanine	Not clean	Crowded	2	Street
40	„	30 „	„ „	„	„	„	„	„	„	„	2	„
3	F.	30 „	„ „	„	„	„	„	„	„	„	2	„
1½	„	7 „	„ 16	„	„	„	„	1st Floor	„	„	1	Yard
70	„	22 „	„ 18	„	„	„	„	2nd Floor	Clean	Not crowded	1	„
23	M.	7 September	Genio, 19	„	Macadamized.	Indifferent	„	Mezzanine	„	„	3	Street
48	F.	7 August	„ 21	„	„	„	„	„	„	„	1	„
60	M.	9 „	Torre, 10	„	„	Good	„	„	„	„	1	„
4	F.	„ „	St. Lucia, 1	„	Properly paved.		No	„	„	„	2	„
3	„	24 „	„ 67	„	Macadamized.	„	Yes	Ground Floor	„	„	2	„
71	M.	5 September	Saluto, 12	„	„	„	„	2nd Floor	„	„	2	„
58	F.	6 „	„ „	„		„	„	3rd Floor	„	„	2	Street and terrace.
13	M.	13 August	„ 60	„	„	„	No	Mezzanine	„	„	2	„
38	„	17 „	Speroni, 1	„	„	„	Yes	„	„	„	1	Street
1⅔	F.	19 „	Irlandese, 16	„	„	„	„	2nd Floor	„	„	1	„
50	M.	20 „	Teatro, 21	„	Properly paved.	Bad	„	Ground Floor	Not clean	„	2	Terrace
65	„	28 „	Felice, 12	„	„	„	„	2nd Floor	Clean	„	2	Street
1 2/12	„	13 September	„ „	„	„	„	No	4th Floor	„	„	2	Yard
42	F.	29 August	Zaccaria, 42	„	„	Good	„	3rd Floor	„	„	2	Street
60	„	2 September	Scozzese, 2 D	„	„	„	„	Mezzanine	„	Crowded	2	—
68	M.	15 „	Alessandro, 38	„	„	„	Yes	Basement	Indifferent	Not crowded	None	Street
15	„	18 October	Seccorso, 11	„	„	Indifferent	„	Ground Floor	Not clean	„	2	„
67	F.	28 „	Cembalo, 14	„	„	Good	„	„	Clean	„	6	Street, Great Harbour.
40	M.	28 July	S. Patrinio, 60	„	Macadamized.	Indifferent	„	„	Kept clean, but damp.	„	1	Street
39	„	9 August	Fontana, 31	„	Not paved	Bad	„	2nd Floor	Clean	„	1	Staircase
70	„	21 „	S. Nicola, 152	„	Macadamized.	Good	No	1st Floor	„	„	1	Yard
40	F.	24 „	Britannica, 166	„	„	Indifferent	Yes	„	„	„	1	Street
44	M.	11 September	Reale, 195	„	Unpaved	Yard bad	No	Below the level of the street.	Not clean	„	1	Yard
			FLORIANA.									
30	F.	26 August	Conservatorio, 9	Drained	Macadamized.	Good	Occasionally.	1st Floor	Indifferent	Not crowded	2	Into yard
2	„	26 „	„ 21	„	„	„	No.	Mezzanine	Clean	„	2	Street
„	„	12 July	„ 64	„	„	„	„	3rd Floor	„	„	1	„
		27 August	„ „	„	„	„	„	Ground Floor	„	Crowded	1	Into yard
		„	Miratore, 19	„	„	„	Smell from adjoining oven where animals were kept.	2nd Floor	„	Not crowded	3	Street and terrace.

from Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Valetta—continued.

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Aqueduct	Good	Sufficient	Carried	No tank	Yes	Yes	Yes	Common privy.	By hand	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	"	"	"	Under house	"	"	"	Both	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Rain and aqueduct.	"	"	Tank	Under yard	"	No	No	Com. privy with piston.	"	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Outer air	Aqueduct	"	"	Carried	Under house, without water.	"	"	Yes	Open sink	"	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	"	"	"	"	"	Yes	"	"	"	"	—
"	Rain and aqueduct.	"	"	Tank	"	"	No	No	"	"	No	—
Outer air	Aqueduct	"	"	Carried	No tank	"	"	Yes	"	"	Yes	—
"	"	"	"	"	Under house (empty).	"	"	"	"	"	"	—
Common stair	"	"	"	"	No tank	"	"	"	"	"	"	—
Outer air	"	"	"	"	"	No	"	No	None	—	—	—
"	Rain and aqueduct.	"	"	Tank	Under room	"	"	"	"	By hand.	Yes	—
"	"	"	"	"	Under house	Yes	"	"	Common privy.	"	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Aqueduct	"	"	Carried	No tank	"	"	"	Open sink	"	Yes	—
"	Rain and aqueduct.	"	"	Tank	Under house	"	Yes	Yes	"	"	No	—
"	"	"	"	Carried	"	"	"	"	"	"	"	—
"	Rain	Brackish	"	Tank	"	"	"	"	"	"	Yes	—
Common stair	Rain and aqueduct.	Good	"	"	"	"	"	"	Com. privy (trapped).	"	No	—
"	"	"	"	"	"	"	"	No	"	"	"	—
A lodging-house	"	"	"	"	"	"	"	Yes	Both	"	Occasionally, yes.	—
Outer air	Rain	"	"	"	"	"	No	"	Open sink	"	"	—
"	Aqueduct	"	"	—	No tank	"	Yes	"	"	"	Yes	—
Common stair	Rain and aqueduct.	"	"	Tank	Under yard	"	"	"	"	"	"	—
Outer air	Aqueduct	"	"	—	No tank	"	"	"	Trapped privy.	"	No	—
"	Rain	"	"	Tank	Partly under room.	"	"	"	Open sink	"	Yes	Died at No. 143 Strada Misida, Casal Birchircara.
Common stair	Aqueduct	"	"	Carried	No tank	"	"	"	"	"	"	Died at No. 39, Strada Reale, Casal Birchircara.
"	"	"	"	"	Yard (emtpy)	"	No	No	"	"	Occasionally, yes.	Died at No. 17, Strada Spiritosa, Casal Zurrico.
Outer air	Rain and aqueduct.	"	"	Tank	Yard	"	Yes	Yes	Trapped privy.	"	No	Died at No. 26, Strada S. Paola, Casal Safi.
Common stair	Rain	"	"	"	"	"	"	"	Open sink	"	Yes	Went to St. George's Bay, whence he was conveyed to the central hospital.
Common stair	Fountain	Good	Sufficient	Carried	No tank	Yes	No	Yes	Open sink	By hand	Occasionally, yes.	—
"	"	"	"	"	Under house	"	"	No	"	"	"	—
"	Aqueduct	"	"	"	Under house into which the drain was opened.	—	"	"	"	"	Yes	—
"	"	"	"	"	"	Yes	"	"	"	"	"	—
Outer air	Rain and aqueduct.	"	"	"	Under house, water tasted badly.	—	"	Yes	"	"	"	—

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths

Town of

Fatal Cases of Cholera.										Windows.	
Age.	Sex.	Date of Death.	Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded." "Not crowded," &c.	State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
45	F.	14 July	Miratore, 40	Drained	Macadamized.	Good	No	Mezzanine	Clean	Not crowded	—	Street
40	„	2 August	Piazza Maggiore, 46	„	„	„	„	4th Floor	„	„	1	Into yard
26	M.	16 July	„ 47	„	„	„	„	Ground Floor	„	„	1	Street
13	F.	3 August	„ 50	„	„	„	Occasionally, yes.	Mezzanine	„	„	1	„
2	M.	17 July	Piazza Miratore, 10	„	„	„	No	Ground Floor	„	Crowded	2	—
21	F.	24 „	„ 19	„	„	„	„	Mezzanine	„	Not crowded	1	Street
80	M.	„ „	Mercato, 4	Undrained			„	„	„	„	2	„
8	F.	10 August	„ 5	Drained	„	„	„	„	„	Crowded	1	„
36	„	28 July	„ 29	„	„	„	Yes	„	„	Not crowded	2	„
3	M.	4 August	„ 47	„	„	„	No	Ground Floor	Indifferent	„	1	„
46	„	11 „	„ 51	—	—	„	„	Mezzanine	Clean	„	2	„
27	F.	17 July	„ 66	Drained	Macadamized.	„	„	„	„	„	3	„
34	M.	13 August	St. Anna, 23	„	„	„	„	2nd Floor	„	„	1	Into yard
36	F.	27 July	„ 70	„	„	„	„	Mezzanine	„	„	2	Street
53	„	31 „	„ „	„	„	„	„	„	„	„	2	„
7	„	21 August	„ 72	„	„	„	„	1st Floor	„	„	2	„
9	„	21 July	Botanico, 27	„	—	„	„	Above the ground.	Indifferent	„	1	„
36	M.	24 „	San Tommaso 31	„	„	„	Yes	2nd Floor	Not clean	„	3	„
48	F.	3 August	„ 60	„	Macadamized.	„	„	„	Clean	„	2	„
3	„	5 „	„ 101	„	„	„	No	Ground Floor	„	„	1	„
45	„	26 July	San Francesco, 25	„	„	„	Yes	2nd Floor	Not clean	Crowded	1	Yard
18	M.	11 August	„ „	„	„	„	„	„	„	„	1	„
1 3/12	„	31 „	„ 29	„	„	„	„	„	Clean	Not crowded	1	Street
11	„	9 „	„ 43	„	„	„	„	Mezzanine	„	„	3	„
23	F.	5 „	„ 44	„	„	„	No	„	Not clean	„	1	„
44	„	1 September	„ 18	„	„	„	Yes	„	Clean	„	3	„
15	M.	28 July	„ 61	„	„	„	No	„	Not clean	„	2	„
43	„	28 „	Capuccini, 24	„	„	„	„	„	Clean	„	3	Into yard
34	F.	13 August	„ 30	„	„	„	Yes	2nd Floor	„	„	2	Street
36	M.	27 July	„ 90	„	„	„	„	3rd Floor	„	„	—	„
70	F.	9 August	Leone, 30	„	„	„	„	4th Floor	„	„	1	„
78	M.	14 „	„ „	„	„	„	„	3rd Floor	„	„	1	„
76	F.	2 „	„ 48	„	„	„	No	Ground Floor	„	„	1	„
42	M.	10 „	Magazzeni, 62	„	„	„	„	3rd Floor	„	„	2	Into yard
19	F.	14 „	„ „	„	„	„	—	2nd Floor	„	„	1	Street
75	M.	„ „	„ 72	„	„	„	Yes	Ground Floor	Indifferent	„	1	Into yard
51	F.	„ „	Giardino, 6	„	„	„	„	Basement	Clean	„	1	Street
33	„	1 September	Stretti, 28	„	„	Indifferent	No	Mezzanine	„	„	1	„
63	„	2 „	„ 80	„	„	„	„	Ground Floor	Indifferent	„	1	„
78	M.	28 August	„ 40	„	„	„	„	„	Not clean	„	None	—
53	F.	13 September	Nuova, 7	„	„	Good	„	2nd Floor	Clean	„	4	Street
45	„	23 „	Piazza Fosse, 14	„	„	„	„	Mezzanine	„	„	1	„
26	M.	17 „	„ 47	„	„	„	„	Ground Floor	Not clean	Crowded	1	„
	F.	13 August	Piazza Maggiore, 40	„	Unpaved	„	„	2nd Floor	Clean	Not crowded	1	Yard
					SENGLEA.							
		ugust	Della Marina, 53	Drained	Macadamized.	Good	No	Mezzanine	Clean	Not crowded	2	Yard and dockyard creek.
			„ 90	„	„	„	„	„	„	„	2	Wharf
			Della Punta, 7	„	Properly paved.	„	„	3rd Floor	„	„	1	Street

from Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Floriana—continued.

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air.	Rain and aqueduct.	Good	Sufficient	Tank	Yes	Yes	No	No	Open sink	By hand	No	—
,,	,,	,,	,,	,,	Under house	,,	,,	,,	Trapped privy.	,,	,,	—
,,	,,	,,	,,	Carried	No tank	,,	,,	,,	Open sink	,,	,,	—
,,	,,	,,	,,	Tank	Under house	,,	,,	,,	,,	,,	,,	—
,,	Rain	,,	,,	Carried	No tank	,,	,,	,,	,,	,,	Occasionally, yes.	—
,,	Aqueduct	,,	,,	Tank	Under house	,,	,,	,,	Trapped privy.	,,	No	—
,,	,,	,,	,,	Carried	No tank	,,	,,	,,	Cesspool	,,	,,	—
,,	Rain and aqueduct.	,,	,,	Tank	Under house	,,	,,	,,	Open sink	,,	Occasionally, yes.	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	Yes	—
,,	Aqueduct	,,	,,	,,	,,	,,	,,	,,	,,	,,	Occasionally, yes.	—
,,	Rain and aqueduct.	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	Aqueduct	,,	,,	,,	—	—	,,	,,	Com. privy trapped.	,,	No	—
,,	Rain and aqueduct.	,,	,,	,,	Under house	Yes	,,	,,	Open sink	,,	Yes	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	Occasionally, yes.	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	Died at No. 58, Strada Mirtore.
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	No	—
,,	Aqueduct	,,	,,	Carried	No tank	,,	,,	,,	,,	,,	,,	—
Common stair	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	Yes	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Outer air	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Common stair	,,	,,	,,	,,	—	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	—	,,	,,	,,	,,	,,	,,	—
Outer air	,,	,,	,,	,,	Under house	,,	,,	,,	,,	,,	,,	—
,,	Rain and aqueduct.	,,	,,	Tank	,,	,,	,,	,,	,,	,,	Occasionally yes.	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	Yes	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	Aqueduct	,,	,,	Carried	Water tasted badly.	,,	,,	,,	,,	,,	—	—
,,	Rain and aqueduct.	,,	,,	Tank	Under house	,,	,,	,,	,,	,,	No	—
,,	,,	,,	,,	,,	Under yard	,,	,,	,,	,,	,,	Occasionally yes.	—
Common stair	Rain	,,	,,	,,	,,	,,	,,	,,	,,	,,	Yes	—
,,	Rain and aqueduct.	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Outer air	Aqueduct	,,	,,	,,	Under house	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	Under Yard	,,	,,	,,	Trapped privy.	,,	No	—
,,	Rain and aqueduct.	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	Under room	,,	,,	,,	Open sink	,,	,,	—
,,	Aqueduct	,,	,,	Carried	No tank	,,	Yes	Yes	,,	,,	Yes	—
,,	Rain and aqueduct.	,,	,,	,,	Under house Water tasted badly.	,,	No	No	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	Occasionally yes.	—
,,	,,	,,	,,	,,	No tank	No	,,	,,	,,	,,	No	—
Common stair	Rain	,,	,,	Tank	Under house	Yes	,,	,,	,,	,,	Occasionally yes.	—
Outer air	Rain and aqueduct.	,,	,,	,,	,,	,,	,,	,,	,,	,,	No	—
,,	,,	,,	,,	,,	,,	No	,,	,,	None	—	—	—
,,	Rain	,,	,,	,,	Under yard	Yes	Gulley in the street.	Occasionally yes.	Trapped privy.	By hand.	No	Died at No. 5, Strada il convento Vittori
Outer air	Aqueduct	Good	Sufficient	Carried	Tank, water tasted badly.	Yes	No	No	Sink	By hand	No	—
,,	,,	,,	,,	,,	None	,,	,,	,,	,,	,,	Occasionally, yes.	—
,,	,,	,,	,,	,,	Underhouse, empty.	,,	,,	,,	,,	,,	,,	—

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths

Town of

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs. 42	F.	1865. 20 August	Della Punta 18	Drained	Properly paved.	Good	No	Mezzanine	Clean	Not crowded	None	—
2	M.	13 „	„ 19	„	„	„	„	„	„	„	1	Street
37	F.	12 „	„ 22	„	„	„	„	Ground Floor	Not clean	„	1	„
67	„	29 „	„ 33	„	„	„	„	„	„	„	2	„
67	„	25 „	„ 64	„	„	„	„	„	Indifferent	„	1	Yard
50	„	29 „	„ 71 B	„	„	„	„	Mezzanine	Clean	„	1	Street
2	M.	31 July	„ 79	„	„	„	„	1st Floor	„	„	1	„
50	F.	1 August	Crosifisso, 40	„	Macadamized.	„	„	„	„	„	1	„
5	M.	9 „	„ 47	„	„	Indifferent	„	„	„	„	2	„
8	F.	11 „	„ „	„	„	„	„	„	„	„	1	Yard
36	„	4 „	„ 55	„	„	Good	„	„	„	„	1	Street
29	M.	4 September	„ 63	„	„	„	Yes	2nd Floor	„	„	1	Yard
42	F.	29 August	St. Guiseppe, 19	„	„	„	„	„	Indifferent	„	2	Street
40	„	„ „	„ 39	„	„	„	No	„	Clean	„	2	Yard
60	„	28 „	„ 191	„	„	„	„	Ground Floor	„	„	1	Street
77	„	3 „	Della Macina, 16	„	„	„	„	1st Floor	„	„	1	Yard
65	M.	„ „	„ „	„	„	„	„	„	„	„	1	„
57	F.	„ „	San Francesco, 1	„	Paved	„	Yes	„	„	„	2	Street
3	„	5 September	St. Angelo, 24	„	Macadamized.	„	No	Ground Floor	Not clean	Crowded	1	Yard
73	M.	4 August	„ 39	„	„	„	„	1st Floor	Clean	Not crowded	1	„
26	F.	7 „	„ 39	„	„	„	„	2nd Floor	„	„	1	„
72	M.	13 „	„ 51	—	—	—	—	—	—	—	—	—
40	F.	26 „	„ 54	Drained	Macadamized.	Good	No	1st Floor	Clean	Not crowded	1	Street
58	M.	8 „	San Giuliano, 22	„	„	„	„	„	„	„	2	„
2	F.	17 September	„ 31	—	—	—	—	—	—	—	—	—
56	„	9 „	Del Bastioni, 3	—	—	—	—	—	—	—	—	—
23	„	26 August	„ 50	Drained	Macadamized.	Good	No	Mezzanine	Clean	Not crowded	1	Street
35	M.	4 September	„ „	„	„	„	„	„	„	„	1	„
8	„	9 August	„ 68	„	„	„	Yes	1st Floor	„	„	2	„
52	F.	31 „	„ 69	„	„	„	„	2nd Floor	„	„	1	Yard
27	„	23 September	„ 72	„	„	„	„	Mezzanine	„	„	1	Street
3	„	24 „	„ „	„	„	„	„	„	„	„	1	„
17	M.	11 August	Santa Cattarina, 14	„	Properly paved.	„	No	1st Floor	„	„	2	„
49	F.	13 „	St. Anna, 5	„	Indifferent	„	„	„	„	„	1	„
40	„	16 „	Del Gregale, 33	„	Bad	Indifferent	„	Ground Floor	Not clean	„	2	Street and Yard.
6	„	24 „	„ 16	„	„	„	Yes	„	„	Crowded	1	Yard
4	„	15 „	Sirena, 1	„	Unpaved	„	No	1st Floor	Clean	Not crowded	2	Street
23	M.	29 „	„ 11	„	Macadamized.	„	„	3rd Floor	„	„	3	„
12	„	5 September	„ 14	„	„	„	„	1st Floor	„	„	1	„
40	F.	17 „	„ 41	„	Unpaved	Good	„	Ground Floor	Indifferent	Crowded	1	„
11	„	23 „	„ „	„	„	„	„	„	„	„	1	„
15	M.	24 „	„ „	„	„	„	„	„	„	„	1	„
50	F.	4 „	„ 66	„	Macadamized.	„	„	„	Clean	Not crowded	3	Creek
„	„	13 „	„ „	„	„	„	„	„	„	„	3	„
„	M.	16 August	Due Porte, 155	„	„	„	„	1st Floor	„	„	2	Street
„	„	4 September	„ 218	„	„	„	„	Ground Floor	„	„	2	„
„	„	August	„ 222	„	„	„	„	Mezzanine	„	Crowded	2	„
„	„	tember	„ 247	„	„	„	„	Ground Floor	„	Not crowded	1	„
„	„	„	„ 154	„	„	„	Yes	„	„	„	1	„
„	„	„	„ 279	„	„	„	„	Mezzanine	„	Crowded	1	„

from Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Senglea—continued.

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Aqueduct	Good	Sufficient	Carried	Yard, empty	Yes	No	No	Sink	By hand	Occasionally, yes.	—
"	"	"	"	"	House, empty	"	"	"	"	"	"	—
"	"	"	"	"	Adjoining house, empty.	"	"	"	"	"	"	—
"	Rain	"	"	Tank	Under house	"	Yes	Yes	"	"	"	—
"	Aqueduct	"	"	Carried	Tank entrance	"	No	No	"	"	Yes	—
"	"	"	"	"	Adjoining house.	"	"	"	"	"	Occasionally, yes.	—
"	"	"	"	"	House, empty	"	"	Yes	"	"	Yes	—
"	Rain	"	"	Tank	Yard	"	"	No	"	"	No	—
"	Aqueduct	"	"	Carried	House, empty	"	Yes	"	"	"	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Tank, entrance, empty.	"	No	"	"	"	No	—
"	"	"	"	"	Tank under house, empty.	"	"	"	Cesspool	"	"	—
"	Rain	"	"	"	Under, near house.	"	"	Yes	Sink	"	Yes	—
"	"	"	"	Tank	Yard	"	"	No	"	"	No	—
"	"	"	"	"	Entrance	"	"	"	"	"	Yes	—
"	"	Tasted badly.	"	"	House, empty	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Aqueduct	Good	"	Carried	"	"	"	"	"	"	"	—
"	Rain	"	"	Tank	Yard	"	"	"	"	"	Occasionally, yes.	—
Common stair	Aqueduct	"	"	"	Under house	"	"	"	"	"	"	—
"	"	"	"	"	"	—	—	"	"	"	"	—
—	—	—	—	—	—	—	—	—	—	—	—	Attacked at the Ospizio, Floriana.
Outer air	Aqueduct	Good	Sufficient	Carried	Street	Yes	No	No	Sink	By hand	Occasionally, yes.	—
—	"	"	"	"	Under	"	"	"	"	"	"	—
—	—	—	—	—	—	"	—	—	—	—	—	—
—	—	—	—	—	—	"	—	—	—	—	—	Attacked at No. Strada, S. Guiseppe, Valetta.
Outer air	Aqueduct	Good	Sufficient	Carried	None	Yes	No	No	Sink	By hand	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Tank under house, empty.	"	Yes	Yes	"	"	Yes	—
Common stair	Rain	"	"	Tank	Yard	"	"	"	"	"	"	—
Outer air	Aqueduct	"	"	"	Under house, empty.	"	"	"	Common privy (trapped).	"	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Rain	"	"	"	Under house	"	No	No	Sink	"	Occasionally, yes.	—
"	Aqueduct	"	"	Carried	Entrance, empty.	"	"	"	"	"	"	—
"	"	"	"	"	House, water tasted badly.	"	"	"	"	"	Yes	—
Common stair	"	"	"	Tank	Room	"	"	"	"	"	"	—
Outer air	Rain	"	"	"	Yard	"	"	"	"	"	No	—
"	Aqueduct	"	"	"	"	"	"	"	"	"	Yes	—
"	"	"	"	Carried	Tank under house, empty.	"	"	"	"	"	"	—
"	Rain	"	"	Tank	Adjoining room.	"	Yes	"	"	"	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	Carried	None	No	No	"	None	—	—	—
"	"	"	"	"	"	"	"	"	"	—	—	—
"	"	"	"	Tank	Yard	Yes	Yes	"	Common privy	By hand	No	—
"	"	"	"	"	Under house	"	"	Yes	Sink	"	"	—
"	"	"	"	Carried	No tank	"	"	"	"	"	"	—
Common stair	Aqueduct	"	"	Tank	Yard, empty	"	"	"	"	"	Yes	—
Outer air	Rain	"	"	"	Under room	"	"	"	"	"	"	—
"	"	"	"	"	Under house	"	"	"	"	"	No	—

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths

Town of

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
65	F.	17 August	Dell' Oratorio, 14	Drained	Macadamized.	Good	No	Ground Floor	Clean	Not crowded	1	Street
76	„	28 „	„ 22	„	„	„	„	„	Indifferent	„	1	Yard
2	M.	17 „	„ 28	„	„	„	„	„	„	„	2	Street-yard
6	„	22 „	San Lorenzo, 61	„	Badly paved.	„	„	Mezzanine	Clean	„	1	Street
2	„	23 „	Porto Salvo, 7	„	Macadamized.	„	„	1st Floor	„	„	2	Terrace
2	F.	1 September	„ 34	„	„	„	Yes	2nd Floor	„	„	2	Street
60	M.	24 „	St. Ursola, 10	„	Bad	Indifferent	No	„	„	„	1	Yard
45	F.	31 August	San Filippo, 24	„	„	„	„	1st Floor	„	„	1	Street
			VITTORIOSA.									
40	F.	14 August	Del Quartiere, 1	Drained	Properly paved.	Good	Yes	Mezzanine	Clean	Not crowded	1	Street
27	„	6 „	„ 3	„	„	„	„	Ground Floor	Indifferent	„	1	Yard
54	„	11 „	„ 23	„	Macadamized.	„	„	Mezzanine	„	„	1	Street
50	M.	20 July	„ 29	„	„	„	„	1st Floor	„	Crowded	1	„
9	F.	30 August	„ 41	„	Properly paved.	Indifferent	„	Ground Floor	—	„	1	„
59	„	25 July	San Giorgio, 10	„	Paved	„	No	Mezzanine	Clean	Not crowded	1	„
4	M.	7 August	„ 13	„	„	„	„	Ground Floor	Indifferent	Crowded	3	„
33	„	9 „	„ „	„	„	„	„	„	„	„	3	„
18	F.	27 „	„ 16	„	„	„	—	1st Floor	„	Not crowded	2	Yard terrace
3	„	31 „	„ 18	„	„	„	No	„	Clean	„	2	Street
15	M.	27 July	„ 20	„	„	„	Occasionally, yes.	„	„	„	2	Street terrace
26	„	10 August	San Lorenzo, 1	„	Properly paved	Good	No	Ground Floor	„	„	1	Facing Bighi
21	F.	15 „	„ „	„	„	„	„	„	„	„	1	„
35	„	5 „	„ 3	„	„	„	Yes	1st Floor	„	„	1	Street
6	M.	24 September	„ 22	„	„	„	„	„	„	Crowded	2	Garden yard
3	F.	25 „	„ „	„	„	„	„	„	„	Not crowded	2	„
11	„	2 August	„ 41	—	—	—	„	3rd Floor	Not clean	„	3	Street
20	„	24 September	„ 63	Drained	Properly paved.	Good	—	Mezzanine	Clean	„	1	„
26	M.	18 August	„ 72	„	„	„	Yes	2nd Floor	„	„	1	„
10	„	„ „	„ „	„	„	„	„	1st Floor	„	„	2	„
10	„	„ „	„ „	„	„	„	—	„	„	„	2	„
44	F.	12 „	„ 73	„	„	„	Yes	Ground Floor	Not clean	Crowded	1	„
6	„	15 „	„ 74	„	„	„	„	1st Floor	Clean	Not crowded	1	„
46	„	10 „	„ 98	„	„	„	„	Ground Floor	„	„	1	„
11	M.	1 September	„ 102	„	Paved	„	„	1st Floor	„	„	1	Yard
37	„	30 „	„ 106	„	Properly paved.	„	„	„	„	„	2	„
3	F.	11 „	Nuova, 7	„	Macadamized.	Indifferent	—	Ground Floor	Not clean	Crowded	1	Street
49	„	12 August	„ 8	„	„	„	Occasionally, yes.	„	„	„	1	Yard
24	„	8 „	„ 28	„	„	Good	No	Terrace	Clean	Not crowded	1	Terrace
3	M.	2 „	„ 30	„	„	„	Yes	2nd Floor	„	„	1	Street
3	„	11 „	Palazzo del Vescovo, 1	„	„	„	No	1st Floor	„	„	1	Yard
88	F.	2 „	„ 12	„	„	„	„	Ground Floor	Not clean	„	2	„
„	„	4 „	„ „	„	„	„	„	Terrace	Clean	„	2	„
„	„	5 „	„ „	„	„	„	„	„	„	„	2	„
„	„	4 „	„ „	„	„	„	„	Ground Floor	Not clean	Crowded	1	„
„	„	„	„ „	„	„	„	„	„	„	„	1	„
„	„	„	„ 13	„	„	„	Yes	„	Indifferent	Not crowded	1	Street
„	„	„	Santa Scolastica, 3	„	„	„	No	„	Clean	„	1	„

from Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Senglea—continued.

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Aqueduct	Brackish	Sufficient	Carried	None	Yes	No	No	Sink	By hand	Yes	—
Common stair	Rain	Good	„	Tank	Under entrance.	„	„	„	„	„	„	—
Outer air	„	„	„	Carried	None	No	„	„	None	—	—	—
„	Aqueduct	„	„	„	House, empty	Yes	Yes	Yes	Sink	By hand	Occasionally, yes.	—
Common stair	„	„	„	„	Yard, empty	„	No	No	„	„	Yes	—
Outer air	„	„	„	„	House, empty	„	„	„	„	„	Occasionally, yes.	—
„	Rain	„	„	Tank	Under yard	„	Yes	Yes	Trapped privy near room.	„	No	—
Common stair	„	„	„	„	Yard	„	No	No	Sink	„	Occasionally, yes.	—
Outer air	Rain	Good	Sufficient	Tank	House	Yes	No	No	Sink	By hand	Yes	—
Common stair	„	„	„	„	Yard	„	Yes	Yes	„	„	„	—
Outer air	„	„	„	Carried	None	„	„	„	„	„	Occasionally, yes.	—
Common stair	„	„	„	„	Under house	„	„	„	Sink proper	„	Yes	—
Outer air	„	„	„	„	None	„	„	„	Sink	„	„	—
„	Aqueduct	„	„	„	Tank under house.	„	No	No	„	„	„	—
„	Rain	„	„	Tank	Under house	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	Yard	„	„	„	„	„	Occasionally, yes.	—
„	Aqueduct	„	„	Carried	Tank under house.	„	„	„	„	„	No	—
Common stair	Rain	„	„	Tank	Yard	„	„	„	„	„	Yes	—
Outer air	„	„	„	„	Outside	No	„	„	None	—	—	—
„	„	„	„	„	„	„	„	„	„	By hand	Yes	—
—	„	„	„	Carried	Tank	Yes	„	Yes	Common privy.	„	„	—
Common stair	Aqueduct	„	„	„	Tank under house (water brackish).	„	Yes	„	Sink	„	„	—
„	„	„	„	„	„	„	„	„	„	„	„	—
Outer air	—	„	„	„	„	„	„	„	„	„	„	—
„	—	„	„	„	„	„	No	No	„	„	Occasionally, yes.	—
„	Rain	„	„	Tank	Under house	„	Yes	Yes	„	„	Yes	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	Carried	—	„	„	„	„	„	„	—
„	„	„	„	Tank	Under house	„	„	„	„	„	No	—
„	—	„	„	Carried	Tank	„	„	„	„	„	Yes	—
„	Aqueduct	„	„	„	Under house (water tasted badly).	„	No	No	„	„	Occasionally, yes.	—
—	—	„	„	Tank	Under yard	„	Yes	Yes	Trapped privy.	—	„	—
„	Rain	„	„	Carried	None	„	—	—	Sink	By hand	„	—
Common stair	„	„	„	Tank	Yard	Yes	Yes	„	„	„	„	—
Outer air	„	„	„	„	House	„	No	No	Com. privy trapped.	„	No	—
„	Aqueduct	„	„	Carried	Tank	„	„	„	Sink	By hand	No	—
„	Rain	„	„	Tank	Yard	„	„	„	Open sink	„	„	—
Common stair	„	„	„	„	Under house	„	Yes	Occasionally, yes.	„	„	Occasionally, yes.	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	„	„	—
Outer air	Aqueduct	„	„	Carried	No tank	„	„	„	„	„	Yes	—
„	„	„	„	„	Tank, under house, empty.	„	„	Yes	Sink	„	No	—

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths

Town of

Fatal Cases of Cholera.											
Age.	Sex.	Date of Death.	Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained," or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows. State No. in affected Room.	Windows. State whether the Windows open into a "Street," "Court," or "both."
		1865.										
Yrs. 27	F.	15 September	Santa Scolastica 10	Drained	Macadamized.	Good	—	1st Floor	Clean	Not crowded	2	Street
20	„	14 „	„ „	„	„	„	—	„	„	„	2	„
3½	„	12 „	15	„	„	„	No	„	„	Crowded	1	„
4	„	24 August	„ 31	„	„	„	—	Ground Floor	„	Not crowded	1	„
60	M.	4 „	„ 49	„	„	—	Yes	Mezzanine	„	„	2	„
21	„	16 September	„ „	„	„	—	„	„	„	„	2	„
20	F.	16 „	„ 57	„	„	Good	—	1st Floor	„	„	2	„
27	M.	20 „	„ 61	„	„	„	—	2nd Floor	„	„	2	Garden
32	F.	16 „	„ 62	„	„	„	No	Ground Floor	„	„	1	„
4	M.	„ „	„ „	„	„	„	„	„	Indifferent	„	1	„
7	F.	„ „	„ „	„	„	„	„	„	„	„	1	„
5	M.	17 „	„ „	„	„	„	„	„	„	„	1	„
12	„	„ „	„ 66	„	„	„	„	1st Floor	Clean	„	1	Street
42	F.	19 „	„ „	„	„	„	„	„	„	„	1	„
27	„	28 „	„ „	„	„	„	„	„	„	„	1	„
63	„	5 August	„ 71	„	„	„	Occasionally, yes.	2nd Floor	„	„	1	„
4	„	19 September	„ 75	„	„	„	Yes	Mezzanine	„	„	1	„
60	M.	10 August	Miratore, 18	„	Indifferent.	„	No	„	„	„	1	„
7	F.	19 September	„ 42	„	Macadamized.	„	„	Ground Floor	„	„	1	„
52	„	30 „	Manderazzio, 3	„	Properly paved.	Indifferent.	„	„	Not clean	„	2	„
1¼	„	17 August	„ 17	„	„	„	„	„	Not clean	„	2	Yard
35	M.	23 September	„ 24	„	„	„	„	„	Clean, damp	„	1	„
48	F.	10 August	„ 43	„	„	„	„	Mezzanine	Clean	„	3	Street, Terrace
35	„	18 „	„ 51	„	„	Good	„	Ground Floor	„	„	1	Street
75	„	29 „	„ 59	„	„	Indifferent	„	„	Not clean	„	2	„
8½	„	13 „	Piazza Vittoria, 3	„	Macadamized.	Good	„	„	Clean	„	—	—
7	„	2 September	Dietro il Convento	—	—	—	—	—	—	—	—	—
3½	M.	6 „	„	—	—	—	—	—	—	—	—	—
25	F.	1 „	„ 3	Drained	Macadamized.	Indifferent	No	1st Floor	Clean	Not crowded	1	Street
53	„	13 August	„ 5	„	Bad	Bad	—	—	—	—	—	—
3	M.	21 „	„ 34	„	Properly paved	Good	No	Mezzanine	Not clean	Not crowded	1	Street
5	„	27 „	Dietro la Prigione, 17	„	Indifferent	„	Yes	Ground Floor	„	Crowded	2	Yard
70	F.	6 September	„ 19	„	Macadamized.	„	No	„	Indifferent	„	1	Street
51	„	15 August	„ 21	„	„	„	„	„	Clean	Not crowded	1	Yard
6	M.	15 „	„ 35	„	„	„	—	„	Indifferent	„	2	Street
6½	„	15 „	Levante, 11	„	Properly paved	„	No	1st Floor	Clean	„	2	„
9	F.	26 August	Torre San Giovanni, 42	„	Macadamized.	„	„	Ground Floor	Not clean	„	1	„
2⅓	M.	17 „	„ 46	„	„	„	„	1st Floor	„	Crowded	2	„
10	„	15 „	„ 50	„	„	„	„	„	Clean	Not crowded	1	Stair
3	„	18 „	„ „	„	„	„	„	„	„	„	1	„
12	F.	16 „	Tramontana, 9	„	„	Indifferent	Yes	„	„	„	3	Terrace and yard
25	„	„ „	„ „	„	„	„	„	„	„	„	1	Street
44	„	30 September	Del Fosso, 9	„	„	Good	No	Ground Floor	Not clean	„	1	„
70	M.	17 August	„ 22	„	„	„	„	„	Clean	„	2	Bastion and yard.
[illegible]	F.	„ „	Palarno del Governatore, 17.	„	„	„	„	1st Floor	„	„	1	Street
[illegible]	„	13 September	Palarno del Governatore. 23.	„	„	„	„	2nd Floor	„	„	1	„
[illegible]	„	17 August	Stretta, 5	„	„	Indifferent	„	1st Floor	„	„	2	„
[illegible]	„	„	„ 5	„	„	„	„	„	„	„	2	„
[illegible]	„	„	Dietro il Quartiere, 44	„	Properly paved.	Good	„	„	„	„	1	„
[illegible]	„	„	Dirimpetto il Convento, 7	„	Macadamized.	Indifferent	„	Ground Floor	„	„	1	„

from Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Vittoriosa—continued.

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply. Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank; "Under Room," or "House," "Under Court," &c.	House Drainage. Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Rain	Good	Sufficient	Tank	Yard, empty	Yes	No	No	Sink	By hand	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Aqueduct	"	"	Carried	Tank, under house, empty.	"	"	"	"	"	"	—
Common stair	"	"	"	Tank	Yard	"	"	"	Sink, yard	"	"	—
Outer air	Rain	"	"	"	Under house	"	Yes	Yes	Sink	"	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Tank, yard	"	"	"	"	"	"	—
"	Aqueduct	"	"	Carried	Yard, empty	"	"	"	"	"	"	—
"	"	"	"	"	Tank, garden	"	No	No	"	"	"	—
"	—	"	"	"	"	"	"	"	"	"	"	—
"	—	"	"	"	"	"	"	"	"	"	"	—
"	—	"	"	"	"	"	"	"	"	"	"	—
"	Rain	"	"	"	Under house, empty.	"	"	"	"	"	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	Tank	Yard	"	Yes	Yes	"	"	"	—
"	Aqueduct	"	"	Carried	Under, near house.	"	"	"	"	"	Yes	—
"	Rain	"	"	Tank	Under	"	No	"	"	"	Occasionally, yes.	—
"	Aqueduct	"	"	Carried	None	No	"	No	None	—	—	—
"	Rain	"	"	Tank	Street	Yes	"	Yes	Sink	By hand	Occasionally, yes.	—
Common stair	"	"	"	"	Yard	"	"	No	Sink yard	"	Yes	—
"	"	"	"	"	Room	"	"	"	Sink	"	No	—
Outer air	"	"	"	"	Under house	"	"	"	"	"	Occasionally, yes.	—
"	Aqueduct	"	"	Carried	No tank	"	Yes	Yes	"	"	"	—
"	"	"	"	"	"	"	No	No	"	"	"	—
"	Rain	"	"	Tank	Entrance	"	"	"	"	"	"	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
Outer air	Rain	Good	Sufficient	Tank	Under house	Yes	No	No	Sink	By hand	Occasionally, yes.	—
—	—	—	—	—	—	—	—	—	—	—	—	Attacked at No. 40, Piazza Maggiore, Floriana.
Outer air	Rain	Good	Sufficient	Tank	Under house	Yes	No	No	Sink	By hand	Occasionally, yes.	—
Common stair	"	"	"	"	"	"	Yes	Yes	"	"	Yes	—
Outer air	Aqueduct	"	"	Carried	"	"	No	No	"	"	"	—
"	"	"	"	"	Empty, no tank.	"	—	—	"	"	"	—
"	"	"	"	Tank	Under house	"	No	No	"	—	Occasionally, yes.	—
"	Rain	"	"	"	Yard	"	"	"	"	By hand	"	—
"	Aqueduct	"	"	Carried	None	"	"	"	Cesspool	"	"	—
"	Rain	"	"	Tank	Yard	"	"	"	Sink	"	Yes	—
"	"	"	"	"	Passage	"	"	"	"	"	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	Aqueduct	"	"	Carried	Tank, yard	"	Yes	Yes	"	"	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Outer air	Rain	"	"	Tank	Under house	"	No	No	"	"	"	—
"	"	"	"	"	Yard	"	"	"	"	"	No	—
"	"	"	"	"	Under house	"	"	"	"	"	"	—
Common stair	Aqueduct	"	"	Carried	"	"	"	"	"	"	Yes	—
Outer air	Rain	"	"	Tank	Behind house	"	Yes	Yes	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Yard	"	"	"	"	"	No	—
"	Aqueduct	"	"	Carried	Tank under house (bad water).	"	No	No	Sink prop.	"	Occasionally, yes.	—

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths

Town of

Fatal Cases of Cholera.											Windows.	
Age.	Sex.	Date of Death.	Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained," or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1856.										
35	M.	13 September	Britannica, 16	Drained	Macadamized.	Good	Yes	1st Floor	Clean	Not crowded	3	Street
69	F.	19 „	„ „	„	„	„	„	„	„	„	1	Yard
82	„	11 October	„ 25	„	„	„	„	„	Indifferent	„	1	Street
3	M.	22 August	„ 58	„	„	„	—	„	Clean	„	1	„
6	„	„ „	„ „	„	„	„	Yes	„	„	„	1	„
64	F.	19 September	St. Antonio, 1	„	Properly paved.	Bad	No	Mezzanine	„	Crowded	1	„
82	„	26 August	„ 26	„	„	Indifferent	—	1st Floor	„	„	1	„
18	M.	„ „	„ 47	„	„	„	Yes	„	„	„	Door open	Yard
38	F.	24 „	„ 108	„	„	„	No	„	„	„	1	„
8	M.	26 „	„ „	„	„	„	„	„	„	„	1	„
6	F.	31 „	Porta Maggiore, 60	„	Macadamized.	Good	„	„	„	Not crowded	1	Street
9	„	5 October	San Filippo, 16	„	„	Indifferent	„	„	Indifferent	Crowded	1	Terrace
74	M.	6 „	„ 20	„	„	„	„	Mezzanine	„	Not crowded	1	Street
29	„	9 September	„ 35	„	„	Good	„	„	Clean	„	2	Street, yard
35	F.	8 „	„ 51	„	„	Indifferent	„	1st Floor	„	„	1	Street
40	„	29 October	„ 63	„	Bad	Bad	„	Ground Floor	„	„	1	Yard
17	„	1 „	Alessandria, 26	„	Macadamized.	Indifferent	„	1st Floor	Indifferent	„	2	Street
7	„	2 „	„ „	„	„	„	„	„	„	„	2	„
			CALCARA.									
21	M.	21 August	Renella, 24 F.	Undrained	Macadamized.	Good	Occasionally, yes.	Mezzanine	Clean	Not crowded	1	Street
8	„	24 „	„ 24 F.	„	„	„	„	„	„	„	1	„
33	F.	15 September	Molo, 4	„	„	„	No	1st Floor	„	„	1	„
72	M.	27 August	„ 42	„	„	„	Yes	Terrace	—	—	—	—
54	F.	9 „	Renella, 6	„	„	„	„	1st Floor	Clean	Not crowded	2	Street
			COSPICUA (Burmola).									
78	M.	10 July	San Michel, 17	Drained	Properly paved.	Good	Yes	Ground Floor	Clean	Not crowded	2	Street, yard
20	F.	13 „	„ „	„	„	„	„	„	„	„	2	„
75	„	17 „	„ „	„	„	„	„	„	„	„	2	„
2	„	23 „	„ 26	„	„	„	„	„	Indifferent	„	1	Yard
7	„	28 „	„ „	„	Bad	Bad	„	„	Not clean	Crowded	1	„
3	„	7 August	„ „	„	„	„	„	„	„	„	1	„
19	M.	30 July	„ 126	—	—	—	—	—	—	—	—	—
6	F.	20 August	„ 168	Drained	Bad	Bad	No	Ground Floor	Clean	Not crowded	2	Into open air
75	M.	21 July	„ 169	—	—	—	—	—	—	—	—	—
3	„	26 „	San Marco, 24	Drained	Properly paved.	Good	Occasionally, yes.	1st Floor	Indifferent	Not crowded	1	Street
81	„	13 „	„ 39	„	„	Indifferent	Yes	„	Clean	Crowded	3	„
26	„	25 „	St. Elena, 23	„	„	Good	„	Above ground	Not clean	Not crowded	1	Yard
4	„	10 August	„ 51	„	„	„	„	Ground Floor	Indifferent	„	1	Street
40	F.	4 „	„ 69	„	Paved, macadamized.	„	No	„	Not clean	„	1	„
5	M.	26 October	Buon Giorno, 34	„	Properly paved.	„	Yes	1st Floor	Clean	„	1	Stair
28	F.	20 „	„ 37	„	„	„	„	Mezzanine	„	„	1	Street
75	„	26 September	„ 67	„	Macadamized.	„	No	Ground Floor	„	„	1	„
	„	11 „	„ „	„	„	„	„	„	„	„	1	„
	„	16 „	„ 72	„	„	„	Yes	„	Not clean	Crowded	1	Yard
		21 July	„ 113	„	Properly paved.	Indifferent	„	„	„	Not crowded	1	Street
		September	„ 120	„	„	„	„	Basement	Indifferent	Crowded	1	Yard
			Aquila, 23	„	„	Good	No	2nd Floor	Not clean	Not crowded	2	„
			31	„	„	„	„	Ground Floor	Indifferent	„	2	Both
			„ 34	„	„	„	„	1st Floor	Clean	„	2	Street

from Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Vittoriosa—continued.

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply. Whence derived.	Water Supply. Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Water Supply. Quantity: "Sufficient," or "Insufficient."	Water Supply. How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Water Supply. Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	House Drainage. Whether any House Drains: "Yes," or "No."	House Drainage. Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	House Drainage. Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	House Drainage. Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	House Drainage. How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	House Drainage. Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	REMARKS.
Outer air	Rain	Good	Sufficient	Carried	Tank	Yes	Yes	Yes	Sink	By hand	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	"	"	"	Under house	"	"	"	"	"	"	—
Outer air	"	"	"	Tank	Yard	"	No	No	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Aqueduct	"	"	Carried	Under house (bad water).	"	Yes	Occasionally, yes.	"	"	No	—
"	Rain	"	"	Tank	Yard	"	No	No	"	"	"	—
Common stair	Aqueduct	"	"	Carried	Under room, empty.	"	Yes	Yes	"	"	Yes	—
Outer air	"	"	"	Tank	Yard	"	No	No	"	"	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Rain	"	"	"	Under house	"	"	"	"	"	No	—
Common stair	"	"	"	"	Yard	"	"	"	"	"	Yes	—
Outer air	"	"	"	"	Under house	"	"	"	"	"	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	Yes	—
Common stair	Aqueduct	"	"	Carried	No tank	"	"	"	"	"	Occasionally, yes.	—
"	Rain	"	"	"	Yard	"	"	"	"	"	"	—
Outer air	"	"	"	"	Under house (water brackish).	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Outer air	Rain	Good	Sufficient	Tank	Garden	Yes	No	No	Sink, cesspool	By hand	Occasionally, yes.	—
"	"	"	"	"	Garden yard	"	—	Yes	"	"	"	—
"	"	"	"	"	"	"	—	"	Sink	"	"	—
"	"	"	"	"	Yard	"	Yes	"	"	"	No	—
"	"	"	"	"	"	"	No	No	Cesspool	"	"	—
Common stair	Rain	Good	Sufficient	Tank	Yard	Yes	No	Yes	Sink	By hand	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Aqueduct	"	"	Carried	Yard, empty	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
—	—	—	—	—	—	—	—	—	—	—	—	This man was a fisherman and slept on his boat.
Outer air	Rain	Good	Sufficient	Tank	Yard	Yes	No	No	Sink	By hand	No	—
—	—	—	—	—	—	—	—	—	—	—	—	Attacked on a ship in the Great Harbour.
Outer air	Rain	Good	Sufficient	Carried	House, empty	Yes	No	No	Sink	By hand	Yes	—
"	"	"	"	"	Yard, empty	"	Yes	"	"	"	Occasionally, yes.	—
"	"	"	"	"	"	"	No	Yes	"	"	Yes	—
"	"	"	"	"	None	"	"	No	"	"	"	—
"	"	"	"	"	"	No	"	"	None	—	—	—
"	"	"	"	Tank	Yard	Yes	"	Yes	Sink	By hand	No	—
"	"	"	"	"	Under adjoining house.	"	"	No	"	"	Yes	—
"	"	"	"	"	Yard	"	"	"	"	"	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Aqueduct	"	"	Carried	House, empty	"	"	Yes	"	"	Yes	—
"	Rain	"	"	"	None	"	"	"	"	"	"	—
"	"	"	"	Tank	House	"	Yes	"	"	"	"	—
"	"	"	"	Carried	Yard, empty	"	"	"	"	"	"	—
Common stair	"	"	"	"	"	"	"	"	"	"	"	—
Outer air	"	"	"	Tank	Entrance	"	No	No	"	"	Occasionally, yes.	—

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths

Town of

Fatal Cases of Cholera.				State whether the Street or Court was "Drained," or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.	Name of Street, Court, Place, &c., and Number or Designation of House where attacked.								State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs. 3	F.	1865. 8 August	Acquilla, 34	Drained	Properly paved.	Good	No	1st Floor	Clean	Not crowded	2	Street
48	„	14 „	„ „	„	„	„	„	„	„	„	2	„
37	„	20 September	San Giorgio, 5	„	Macadamized.	„	Yes	Ground Floor	„	„	2	Into street
56	M.	26 July	„ 77 D	„	„	„	„	„	„	„	2	„
20	„	28 October	„ 94	„	„	„	No	„	„	„	2	Street, yard
1½	„	26 July	Concezione, 17	„	Properly paved.	„	„	„	„	„	1	Street
2	F.	7 August	Concezione Vicolo, 66	„	Bad	Bad	Yes	1st Floor	„	„	2	„
26	„	10 „	„ „	„	„	„	„	„	„	„	2	„
33	M.	11 „	„ „	„	„	„	„	„	„	„	1	„
56	„	30 July	Scalòni, 8	„	Paved	Good	No	Ground Floor	„	„	1	„
36	F.	„ „	Britannica, 6	„	Macadamized.	„	„	„	Not clean	„	1	Yard
4	„	31 „	„ 18	„	„	Bad	„	„	Clean	„	1	„
3	M.	31 „	St. Giovanni, 36	„	„	Good	„	„	„	„	2	Street
2	„	6 August	Irlandese, 8	„	Bad	Bad	Yes	„	Indifferent	Crowded	2	Both
4	„	„ „	„ „	„	„	„	„	„	„	„	2	„
40	„	„ „	„ „	„	„	„	„	„	„	„	2	„
8	„	9 „	„ „	„	„	„	„	„	„	„	2	„
1½	„	14 „	„ 9	„	„	„	„	„	Clean	Not crowded	2	„
26	„	5 „	„ 10	„	„	„	„	Basement	„	„	1	Yard
6	„	„ „	„ „	„	„	„	„	„	„	„	1	„
49	„	1 „	„ „	„	„	„	„	„	„	„	1	„
„	„	„ „	„ „	„	„	„	„	„	Not clean	„	None	—
27	F.	24 September	„ „	„	„	„	„	1st Floor	Clean	„	2	Both
22	„	17 July	„ 16	„	„	„	„	„	„	„	2	Yard, terrace
80	„	6 August	Campanile, 3	„	Properly paved.	Indifferent	No	Ground Floor	Indifferent	„	1	Street
35	M.	21 „	„ 19	„	„	„	Yes	„	Clean	„	2	Yard
26	F.	1 „	„ 22	„	„	„		„	Indifferent	„	1	Passage to yard
68	„	2 „	„ „	„	„	„		„	„	„	1	„
69	„	„ „	„ 46	„	„	„		„	„	„	1	Street
2½	„	1 „	Marina, 106	„	Macadamized.	„	„	1st Floor	Clean	„	2	„
22	M.	8 „	„ „	„	„	„	„	„	„	„	2	„
49	F.	4 September	„ 165	„	„	„	„	2nd Floor	Indifferent	Crowded	None	—
5	M.	24 „	„ „	„	„	„	„	1st Floor	„	„	1	Yard
1½	„	15 August	„ „	„	„	„	„	„	Not clean	„	None	—
9	„	4 „	Sofia, 26	„	Properly paved.	„	„	Ground Floor	Indifferent	Not crowded	1	Yard
3	F.	21 August	„ 27	„	„	Indifferent	Yes	1st Floor	Not clean	„	2	Yard and terrace.
45	„	11 September	Cospicua, 6	„	Bad	Good	No	„	Clean	„	1	Yard
48	„	„ „	„ 61	„	„	Indifferent	„	Ground Floor	Not clean	„	1	„
25	„	12 October	„ 69	„	„	„	„	„	Indifferent	„	2	„
70	M.	5 August	„ 77	„	„	„	„	„	Not clean	„	1	„
25	F.	„ „	Porta Burmola, 19	„	Macadamized.	„	Yes	Mezzanine	Clean	„	2	Street, yard
35	„	6 „	Vicolo Santa Teresa, 32	„	Bad	„	No	Ground Floor	„	„	1	Yard
4	M.	18 „	Vicolo Terre, 17	„	Properly paved.	Good	Yes	1st Floor	„	„	1	„
1½	F.	8 „	„ 87	„	„	Indifferent	No	Ground Floor	„	„	1	„
„	„	„ „	„ „	„	„	„	„	„	„	„	1	„
		12 September	Vicolo Cordina, 86	„	„	„	Yes	1st Floor	Indifferent	„	1	„
		9 August	„ 87	„	„	„	No	Mezzanine	Clean	„	1	Street
		„	Leone, 14	„	„	„	Yes	„	„	„	1	„
			Nelson, 28	„	„	Good	„	1st Floor	Indifferent	„	1	Into street
			„ 38	„	„	Indifferent	„	Ground Floor	„	„	1	Into stair
			San Rocco, 12	„	Paved	„	„	1st Floor	Clean	„	1	Street

from Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Cospicua—continued.

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply. Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	House Drainage. Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks
Outer air	Rain	Good	Sufficient	Tank	Entrance	Yes	No	No	Sink	By hand	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Yard	"	Yes	Yes	"	"	Yes	—
"	Aqueduct	"	"	Carried	House, empty	"	No	"	"	"	"	—
"	Rain	"	"	Tank	Yard	"	"	No	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	Occasionally, yes.	—
"	Aqueduct	"	"	Carried	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Rain	"	"	Tank	"	"	"	"	"	"	"	—
"	"	"	"	"	House	"	"	"	"	"	Yes	—
"	"	"	"	"	Near yard	"	"	"	"	"	"	—
"	Rain and aqueduct.	"	"	Carried	None	"	"	"	"	"	"	—
"	Rain	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	House	"	"	"	"	"	Occasionally, yes.	—
Outer air	Aqueduct	"	"	Carried	None	"	Yes	Yes	"	"	"	—
"	Rain	"	"	Tank	Yard	"	No	No	"	"	"	—
"	"	"	"	"	Under house	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	Yes	Yes	"	"	Yes	—
"	Aqueduct	"	"	Carried	Tank not used.	"	No	No	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	"	"	"	Tank, yard, empty.	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Yard, water bad.	"	Yes	Yes	"	"	"	—
Outer air	Rain	"	"	Tank	Yard	"	"	"	"	"	"	—
"	"	"	"	"	"	"	No	No	"	"	No	—
"	"	"	"	"	Under house	"	"	"	"	"	"	—
"	"	"	"	"	Under yard	"	"	"	"	"	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Under house	"	"	"	"	"	Yes	—
"	Aqueduct	"	"	Carried	Under yard, (empty).	"	"	"	"	"	No	—
"	Rain and aqueduct.	"	"	"	Under yard	"	Occasionally, yes.	Yes	"	"	Yes	—
Common stair	"	"	"	"	" (empty).	"	No	No	"	"	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	Yes	"	"	"	No	—
Outer air	Rain	"	"	Tank	Under house	"	No	"	"	"	Yes	—
"	Aqueduct	"	"	Carried	None	"	Yes	Yes	"	"	"	—
Common stair	"	"	"	"	"	"	No	No	"	"	"	—
Outer air	"	"	"	"	Under yard, (empty).	"	"	"	"	"	"	—
"	Rain	"	"	Tank	Entrance	"	"	Yes	"	"	Occasionally, yes.	—

TABLE XVIII.—Statistical Return showing the Sanitary Condition of Dwellings of the Civil Population where Deaths

Town of

Fatal Cases of Cholera.											Windows.	
Age.	Sex.	Date of Death.	Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained," or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
45	M.	16 August	San Rocco 19	Drained	Paved	Good	No	Ground Floor	Not clean	Crowded	1	Yard
32	F.	22 „	„ „	„	„	„	„	„	Clean	„	None	—
12	„	21 „	„ 23	„	„	Indifferent	„	„	„	Not crowded	1	Street
35	M.	„ „	„ 28	Undrained	Macadamized.	„	„	Above ground	Not clean	Crowded	1	„
42	„	19 „	Conservatorio, 4	—	—	—	—	—	—	—	—	—
11	F.	22 „	Vicolo Scozzese, 40	Drained	Properly paved.	Indifferent	No	Ground Floor	Indifferent	Crowded	1	Street
35	„	6 „	„	„	„	„	„	„	„	„	1	„
42	M.	24 „	Bonnici, 2	„	„	Good	Yes	1st Floor	Clean	Not crowded	2	„
16	„	„ „	„ 16	„	Macadamized.	„	„	Ground Floor	„	Crowded	2	„
26	F.	25 „	„ 23	„	„	„	„	„	„	Not crowded	1	„
8	„	26 „	„ 27	„	„	„	„	„	„	„	2	„
42	M.	24 „	„ 76	„	„	„	„	„	„	„	4	„
38	F.	„ „	„ „	„	„	„	„	„	„	„	4	„
77	M.	29 July	„ 77	—	—	—	—	—	—	—	—	—
5	„	26 August	Santa Maria, 65	Drained	Properly paved.	Good	No	Mezzanine	Indifferent	Not crowded	1	Street
29	F.	31 „	„ „	„	„	„	„	„	„	„	1	„
14	M.	30 „	„ 66	„	„	„	„	Ground Floor	Not clean	Crowded	1	Yard
2	„	27 „	Guglielmo, 6	„	Bad	Indifferent	Yes	Mezzanine	Clean	Not crowded	3	Street, garden, and burying-ground.
55	„	9 September	Zabbar Gate	Undrained	Unpaved	Good	No	Ground Floor	Indifferent	„	None	—
75	F.	8 „	Stretta, 40	Drained	Bad	Indifferent	Yes	„	Clean	„	1	Street
3	M.	22 „	„ 51	„	„	Good	„	Basement	Not clean	Crowded	1	Yard
12	„	12 „	Santa Margarita, 26	„	Macadamized.	„	No	Ground Floor	Indifferent	Not crowded	1	„
29	„	14 „	San Lazzaro, 19	„	Properly paved.	„	„	2nd Floor	Clean	„	2	Street
8	F.	22 „	„ 19	„	„	„	„	„	„	„	2	„
7	„	14 „	„ 50	„	„	Indifferent	„	Ground Floor	„	„	1	„
34	„	16 „	„ 80	„	„	Good	„	2nd Floor	„	„	1	„
$2\frac{8}{12}$	„	20 „	Stella, 14	„	Macadamized.	Bad	Yes	Ground Floor	„	„	2	Terrace, yard
55	„	2 October	Alessandro, 21	„	Properly paved.	Good	No	1st Floor	„	„	2	Street, yard
50	„	19 „	„ 26	„	„	„	„	„	Indifferent	„	3	Street
20	„	20 „	„ „	„	„	„	„	„	„	„	3	„
$1\frac{7}{12}$	M.	„ „	„ „	„	„	„	„	„	„	„	3	„
9	„	21 „	„ „	„	„	„	„	„	„	„	3	„
78	F.	26 July	„ 34	„	„	„	„	„	Clean	„	2	Street and yard.
33	M.	29 „	„ „	„	„	„	„	Ground Floor	„	„	2	„
8	„	14 September	„ 37	„	„	Indifferent	„	„	„	„	2	Yard and terrace.
$2\frac{2}{12}$	F.	15 „	„ „	„	„	„	—	„	„	„	2	„
5	„	20 „	„ 38	„	„	„	No	„	„	„	1	Street
18	„	„ „	Nunnery	„	Macadamized.	Good	Yes	„	„	„	5	„
20	„	23 „	„	„	„	„	„	„	„	„	5	„
17	„	28 „	„	„	„	„	„	„	„	„	5	„
42	„	4 October	„	„	„	„	„	„	„	„	5	„
55	M.	12 September	Mercato S. Paolo, 1	„	„	„	No	„	Not clean	„	4	„
F.		28 July	„ „ 23	„	„	„	„	„	Clean	„	2	„
M.		18 September	Stretta, 51	—	—	—	—	—	—	—	—	—
		7 „	Market S. Paolo, 77	Drained	Properly paved.	Good	Yes	Terrace	Clean	Not crowded	2	Street
			CORRADINO.									
		mber	Molo San Francesco, 67	Undrained	Unpaved	Bad	No	1st Floor	Not clean	Crowded	2	Sea-wharf

from Cholera occurred in Valetta, Floriana, Senglea, Vittoriosa, and Cospicua, during the Epidemic of 1865—*continued.*

Cospicua—continued.

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air"	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Common stair	Aqueduct	Good	Sufficient	Carried	Under house, (empty).	Yes	No	No	Sink	By hand	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Rain	"	"	"	Tank, under house, empty.	"	"	"	"	"	Occasionally, yes.	—
"	"	"	"	"	Tank, yard, (empty).	"	"	"	"	"	Yes	—
—	—	—	—	—	—	—	—	—	—	—	—	This man was a boatman, and slept on his boat.
Outer air	Rain	Good	Sufficient	Carried	Tank, under house, empty.	Yes	No	No	Sink	By hand	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	None	"	Yes	Yes	"	"	"	—
"	"	"	"	Tank	Under house	"	"	"	"	"	"	—
"	"	"	"	"	"	"	No	No	"	"	"	—
"	"	"	"	"	"	"	"	Yes	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
—	—	—	—	—	—	—	—	—	—	—	—	This man was attacked on board a ship anchored in the French Creek.
Outer air	Rain	Good	Sufficient	Carried	None	Yes	No	No	Sink	By hand	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	"	"	"	Yard, empty	"	"	"	"	"	"	—
Outer air	"	"	"	"	None	"	"	"	"	"	No	—
"	"	"	"	"	"	No	"	"	None	—	—	—
"	"	"	"	Tank	Yard	Yes.	"	Yes	Sink	By hand	Yes	—
Common stair	"	"	"	Carried	Yard, empty	"	Yes	"	"	"	"	A very dirty house.
Outer air	"	"	"	Tank	Garden	"	No	No	"	"	No	—
"	"	"	"	Carried	None	"	"	"	"	"	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	Tank	Yard	"	"	"	Cesspool	"	No	—
"	"	"	"	"	House	"	"	"	Sink	"	"	—
Common stair	"	"	"	Carried	House, empty	"	"	"	"	"	Yes	—
Outer air	"	"	"	Tank	Yard	"	"	"	"	"	No	—
"	"	"	"	"	"	"	Yes	Yes	"	"	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	No	No	"	"	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	Carried	House, empty	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	Tasted badly.	"	Partially carried.	Yard	"	"	"	"	"	Yes	—
—	"	Good	"	Tank	House	"	Yes	Yes	"	"	"	—
—	"	"	"	"	"	"	"	"	"	"	"	—
—	"	"	"	"	"	"	"	"	"	"	"	This nun died at No. 11, Sda. Reale, Vicolo S. Vincenzo, Casal Zabbar.
—	"	"	"	"	"	"	"	"	"	"	"	—
Outer air	Aqueduct	"	"	Carried	None	"	No	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
—	—	—	—	—	—	—	—	—	—	—	—	This man nursed [illegible] Patients, and [illegible] at his house.
Common stair	Aqueduct	Good	Sufficient	Carried	None	Yes	Yes	Yes	Sink	By hand	Yes	
"	Rain	"	"	"	"	No	No	No	None	—	—	

TABLE XIX.—STATISTICAL RETURN showing the SANITARY CONDITION of DWELLINGS in VILLAGES of

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
MISIDA AND PIETÀ.												
Yrs. 9	F.	1865. 15 August	Concezione, 3	Undrained	Unpaved	Bad	No	Ground Floor	Indifferent	Crowded	2	Street, garden
49	„	16 July	„ 8	„	„	Good	„	Mezzanine	Clean	Not crowded	1	Street
47	„	„ „	„ 10	„	„	„	„	„	„	„	1	„
40	„	17 „	„ 28	„	„	„	Yes	Ground Floor	„	„	2	„
30	„	20 „	„ 56	„	„	„	No	Mezzanine	„	„	1	Street, garden
3	„	27 „	„ „	„	„	„	„	„	„	„	1	Street
28	„	18 „	„ 63	„	„	„	„	Ground Floor	„	„	1	„
4/12	„	23 August	„ 83	„	„	Indifferent	„	1st Floor	„	„	3	„
„	„	25 July	„ 89	„	„	Bad	Yes	Ground Floor	Not clean	Crowded	1	Yard
37	M.	16 „	„ 119	„	„	Good	No	Mezzanine	Clean	Not crowded	1	„
28	F.	18 „	„ „	„	„	„	„	„	„	„	1	„
40	„	17 „	„ 121	„	„	„	„	„	„	„	2	Both
75	„	20 „	„ „	„	„	„	„	„	„	„	2	„
13	M.	„ „	„ 128	„	„	„	„	Ground Floor	Not clean	Crowded	1	Street
7/12	F.	6 August	„ 132	„	„	„	„	Mezzanine	„	„	3	Street, garden
19	M.	23 „	„ Vicolo, 2	„	„	Indifferent	„	3rd Floor	Clean	Not crowded	2	Garden
21	„	30 „	„ „ 4	„	„	„	„	Mezzanine	„	Crowded	1	Canal
6	„	19 July	S. Guiliano Vecchio, 10	„	„	„	„	2nd Floor	„	Not crowded	1	Street
10	„	20 August	„ 18	„	„	Good	„	Ground Floor	Indifferent	„	1	„
11	„	28 „	„ 21	„	„	Indifferent	„	„	Not clean	Crowded	1	„
8	F.	13 „	Vallone Misida, 1	„	„	„	„	Mezzanine	Clean	Not crowded	2	Both
11	M.	27 July	„ 3	Drained	„	„	„	„	Indifferent	Crowded	2	„
66	„	5 August	„ 6	Undrained	„	„	„	Ground Floor	Clean	„	1	Street
29	„	22 „	„ 7	Drained	„	Good	Yes	Mezzanine	„	Not crowded	1	Court
49	F.	24 „	„ „	„	„	„	„	„	„	Crowded	1	„
5	„	9 „	„ 16	„	„	Indifferent	No	Ground Floor	Indifferent	Not crowded	2	Both
17	„	21 July	„ 106	Undrained	„	„	Yes	Mezzanine	Clean	Crowded	1	Street
35	M.	22 „	Haramea, 11	„	„	Good	„	Ground Floor	Indifferent	„	1	„
66	F.	12 August	Molo Misida, 166	„	„	„	„	„	Clean	Not crowded	None	—
34	„	25 July	„ 190	„	„	„	„	1st Floor	„	„	1	Garden
63	„	4 September	„ 198	„	„	„	„	Ground Floor	„	„	1	Room
1	„	23 August	„ 202	„	„	„	„	„	„	„	2	Street, terrace
3	„	2 „	Santa Venera, 3	„	„	„	Occasionally, yes.	„	Not clean	„	1	Street
5	M.	3 „	Molo Pietà, 79	„	„	„	Yes	„	„	„	2	Wharf
62	F.	16 „	„ 124	„	„	„	Occasionally, yes.	Mezzanine	Clean	„	1	„
1 12/12	M.	2 September	„ Vicolo, 1°, 1	„	„	„	No	Ground Floor	„	„	1	Yard
28	F.	15 August	„ „ 2°, 23D	„	„	„	„	„	„	„	1	Garden
70	M.	13 „	„ „ „ (?)	„	„	„	„	Open Field	—	—	—	—
11	F.	6 September	„ „ 3°, 103	„	„	„	„	Mezzanine	Clean	Not crowded	1	Street
SLIEMA.												
72	F.	7 August	Vicolo, 5	Undrained	Unpaved	Indifferent	No	Ground Floor	Clean	Not crowded	2	Street, garden
MISRAH EL BARRIERI.												
	M.	25 August	37	Undrained	Unpaved	Good	Yes	Mezzanine	Clean	Crowded	2	Street
RABATO OF NOTABILE.												
		August	Doni, 15	Undrained	Unpaved	Indifferent	No	1st Floor	Indifferent	Crowded	1	Street
		tember	„ 19	„	„	„	„	Ground Floor	Clean	Not crowded	2	Yard
			„ 31	„	„	Good	Yes	„	Not clean	„	1	„

MALTA, where CASES of CHOLERA occurred, during the EPIDEMIC of 1865 (prepared by Dr. Ghio).

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good" "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Aqueduct	Good	Sufficient	Carried	None	No	No	No	None	—	—	—
"	"	"	"	"	Yard	Yes	"	Yes	Sink	By hand	Yes	—
"	"	"	"	"	"	"	"	No	"	"	"	—
"	Rain	"	"	Tank	"	"	Yes	Yes	Cesspool	"	"	—
"	Aqueduct	"	"	Carried	None	"	No	No	"	"	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	Yes	Sink	"	Yes	—
"	Rain	"	"	Tank	Yard	"	"	No	Common privy.	"	Occasionally, yes.	—
"	Aqueduct	"	"	Carried	None	"	Yes	Yes	Sink	"	No	—
"	Rain	"	"	Tank	Yard	"	No	No	Cesspool	"	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Aqueduct	"	"	Carried	None	No	"	"	None	—	—	—
"	Rain	"	"	Tank	Garden	Yes	"	"	Cesspool	By hand	No	—
"	"	"	"	"	House	"	"	"	Sink	"	"	—
"	Aqueduct	"	"	Carried	None	No	"	"	None	—	—	—
"	Rain	"	"	Tank	Street	"	"	"	"	—	—	—
"	Aqueduct	"	"	Carried	None	Yes	"	"	Cesspool	By hand	No	—
"	"	"	"	"	"	No	"	"	None	—	—	—
"	"	"	"	"	"	Yes	"	"	Sink	By hand	No	—
Common stair	"	"	"	"	"	"	"	"	"	"	Occasionally, yes.	—
Outer air	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Court	"	"	Yes	"	"	Yes	—
"	"	"	"	"	"	"	"	"	"	"	No	—
"	Rain	"	"	Tank	Yard	"	Yes	"	"	"	"	—
"	Aqueduct	"	"	Carried	"	"	"	"	Cesspool	"	Occasionally, yes.	—
"	"	"	"	"	None	No	No	No	None	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	Rain	"	"	Tank	House	Yes	"	"	Cesspool	By hand	"	—
"	"	"	"	"	Room	"	"	"	"	"	No	—
"	Aqueduct	"	"	Carried	Empty	"	Yes	Yes	"	"	Yes	—
"	"	"	"	"	None	"	No	"	Dung room	"	Occasionally, yes.	—
"	"	"	"	"	"	"	Yes	"	Sink	"	Yes	—
"	Rain	Tasted badly	"	Tank	Garden	"	No	No	"	"	No	—
"	"	Good	"	"	Yard	"	"	"	Cesspool, trapped.	"	"	—
"	"	"	"	Carried	"	No	"	"	None	—	—	—
—	"	"	"	Tank	Field	"	"	"	"	—	—	—
Outer air	"	"	"	"	House	Yes	"	"	Sink	By hand	No	—
Outer air	Rain	Good	Sufficient	Tank	Garden	Yes	No	Yes	Sink	By hand	No	—
Outer air	Rain	Good	Sufficient	Carried	None	No	No	No	None	—	—	—
Outer air	Rain	Good	Sufficient	Drawn from tank.	Under house.	Yes	No	No	Cesspool	Not supplied.	Occasionally, yes.	—
Common stair	Spring	Brackish	"	Drawn from well.	Staircase	"	"	"	"	"	Yes	—
Outer air	Rain	Good	"	Tank	Yard	No	"	"	Cellar	"	Occasionally, yes.	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs. 4	M.	1865. 9 September	Doni, 46	Undrained	Unpaved	Indifferent	Yes	1st Floor	Indifferent	Not crowded	2	Street
50	„	20 July	„ 65	„	„	Good	No	„	Clean	„	1	„
58	„	17 „	„ 70	„	„	„	„	Ground Floor	Not clean	„	None	None
79	„	30 August	Osservanti, 1	„	„	„	„	„	Clean	„	2	Both
63	F.	4 September	„ 5	„	„	„	„	1st Floor	Indifferent	„	2	Street
44	„	24 July	„ 30	„	„	Indifferent	„	„	„	Crowded	1	„
25	M.	2 August	Ospedale, 26	„	„	Good	„	„	„	Not crowded	1	„
28	F.	26 July	„ 27	„	„	„	„	„	Clean	„	3	Both
60	„	9 September	„ Vicolo 1°, 1	„	„	„	„	Ground Floor	„	„	1	Yard
34	„	28 August	Reals, 15	„	„	„	„	1st Floor	„	„	2	Street
40	„	11 „	„ Vicolo 1°, 4	„	„	Indifferent	„	„	„	„	1	„
33	M.	8 „	„ „ 2°, 5	„	„	Good	„	„	Indifferent	„	1	„
40	„	20 „	„ „ „	„	„	„	„	„	„	Crowded	2	„
40	„	1 „	Convent of St. Dominic	„	„	„	„	„	Clean	Not crowded	1	Field
36	F.	10 September	S. Bartolomeo, 13	„	„	„	„	Ground Floor	Indifferent	Crowded	1	Yard
55	M.	2 August	„ 17	„	„	„	„	1st Floor	„	Not crowded	1	„
70	F.	30 „	„ 25	„	„	„	„	„	Clean	„	1	Street
60	„	14 September	„ 49	„	„	„	„	„	Indifferent	„	1	„
„	„	26 „	Hal Bajada, 11	„	„	„	„	Ground Floor	Not clean	„	1	Yard
„	„	7 August	„ 16	„	„	„	„	1st Floor	Clean	„	1	Street
„	M.	24 „	„ 24	„	„	„	Yes	„	„	„	1	Yard
22	F.	20 September	„ 51	„	„	„	No	Ground Floor	„	Crowded	2 vents.	„
53	M.	11 August	„ 60	„	„	„	Yes	1st Floor	„	Not crowded	1	Street
54	„	5 „	„ 64	„	„	„	No	Ground Floor	„	„	2 vents.	Yard
62	„	8 „	„ 70	„	„	„	Yes	1st Floor	Indifferent	„	1	Street
3	F.	9 „	„ 91	„	„	„	No	Ground Floor	Clean	„	1	Yard
21	„	21 „	„ Vicolo 1°, 7	„	„	„	„	1st Floor	„	„	1	Field
52	M.	4 September	„ „ 2°, 2	„	„	„	—	Ground Floor	Not clean	„	1	Yard
26	F.	18 „	„ „ „ 3	„	„	„	No	„	„	„	2 vents.	„
32	M.	12 August	San Cataldo, 1	„	„	„	—	„ (shop).	„	„	1	Street
43	F.	2 „	„ 3	„	„	„	No	„	Clean	„	2 vents.	Yard
4	M.	9 September	„ 22	„	„	„	„	1st Floor	„	Crowded	1	Street
8	F.	13 „	„ „	„	„	„	„	„	„	„	1	„
50	„	8 August	„ 46	„	„	„	„	„	„	Not crowded	2 vents.	Yard
70	„	17 September	„ 53	„	„	„	„	Ground Floor	Indifferent	„	1	„
56	„	29 August	Catacombe Vicolo 1°, 36	„	„	Indifferent	„	1st Floor	„	Crowded	None	—
52	„	10 „	„ 37	„	„	„	„	Ground Floor	Clean	Not crowded	3 vents.	Yard
53	„	28 September	„ 2°, 36	„	„	„	„	„	„	Crowded	2 vents.	„
28	„	29 August	Collegio, 2	„	„	Good	Yes	1st Floor	„	Not crowded	2	„
24	„	17 „	„ 3	„	„	„	„	Ground Floor	Not clean	„	2	Street entrance
5	M.	15 „	„ „	„	„	„	„	„	„	„	2	„
61	F.	13 September	„ 5	„	„	„	No	„	Clean	„	1	Street
76	„	11 August	„ 29	„	„	„	„	„	Indifferent	„	1	Yard
82	„	27 „	St. Agostino, 3	„	„	„	Yes	„	Clean	„	None	—
60	„	2 „	„ 8	„	„	„	No	1st Floor	„	„	1	Street
„	„	19 „	„ 23	„	„	„	„	„	„	„	2	„
„	„	10 September	„ 24	„	„	„	„	„	„	„	2	„
„	„	14 August	„ 34	„	„	„	„	„	„	„	2	Both
„	„	eptember	„ 39	„	„	„	„	„	„	„	1	Yard
„	„	st	„ 58	„	„	„	„	„	„	„	2	Street
„	„	„	Vittoria, 34	„	„	„	„	„	„	„	1	Yard

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By "Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Rain	Brackish	Sufficient	Tank	Entrance	Yes	No	No	Cesspool	Not supplied.	No	—
„	„	Good	„	„	„	„	„	„	„	„	Occasionally, yes.	—
„	„	„	„	„	„	„	„	„	„	„	No	—
„	„	„	„	„	House	„	„	„	„	„	„	—
„	Aqueduct	„	„	Carried	House (empty).	„	„	„	„	„	Occasionally, yes.	—
„	Rain	„	„	Tank	Yard	„	„	„	„	„	„	—
Common stair	„	„	„	„	Entrance	„	„	„	„	„	„	—
„	„	„	„	„	„	No	„	„	Cellar	„	„	—
Outer air	Spring	„	„	Well	Yard	„	„	„	„	„	No	—
„	Rain	„	„	Tank	House	Yes	„	„	Cesspool	„	Occasionally, yes.	—
„	Rain, aqueduct.	„	„	Carried	None	„	„	„	„	„	No	—
Common stair	Rain	„	„	Tank	Yard	„	„	„	„	„	Occasionally, yes.	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	House	„	„	Yes	„	„	Yes	—
Outer air	Spring	„	„	Carried	None	„	„	No	„	„	No	—
„	Rain	„	„	Tank	House	„	„	„	„	„	„	—
„	Spring	„	„	Carried	Entrance (empty).	„	„	„	„	„	Yes	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	Rain, spring	„	„	„	Yard, water brackish.	No	„	„	Cellar	„	Occasionally, yes.	—
„	Rain	„	„	Tank	Yard	„	„	„	„	„	No	—
„	Spring	„	„	Carried	House, water brackish.	„	„	„	Garden	„	„	—
„	Rain	„	„	Tank	Without	„	„	„	Dung room	„	Occasionally, yes.	—
„	Spring	„	„	Carried	Yard, water brackish.	„	„	„	„	„	No	—
„	Rain	„	„	Tank	Entrance	Yes	„	„	Cesspool	„	Occasionally, yes.	—
„	Spring	Brackish	„	Well	House	No	„	„	Grotto	„	Yes	—
„	Rain	Good	„	Tank	Yard	„	„	„	Cellar	„	No	—
„	Spring	„	„	Well	„	„	„	„	Grotto	„	„	—
„	„	„	„	Carried	None	„	„	„	Dung room	„	Yes	—
„	„	„	„	„	Yard (empty)	Yes	„	„	Cesspool	„	No	—
„	„	„	„	„	None	No	„	„	None	—	„	—
„	Rain	„	„	Tank	Yard	„	„	„	Dung room	Not supplied.	„	—
„	„	„	„	„	House	Yes	„	„	Cesspool	„	Yes	—
„	„	„	„	„	„	„	„	„	„	„	„	—
Common stair	„	„	„	„	Yard	No	„	„	Cellar	„	Occasionally, yes.	—
Outer air	„	„	„	„	„	„	„	„	„	—	Yes	—
Common stair	„	„	„	„	„	„	„	„	Garden	—	No	—
„	„	„	„	„	Grotto	„	„	„	Cellar	—	„	—
Outer air	„	„	„	„	Yard	„	„	„	Dung room	—	„	—
„	„	„	„	„	„	Yes	„	„	Cesspool	Not supplied.	„	—
„	Spring	„	„	Carried	Yard (empty)	No	„	„	Dung room	—	„	—
„		„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	None	Yes	„	Yes	Cesspool	Not supplied.	Yes	—
Common stair	„	„	„	„	Yard (empty)	„	„	No	„	„	Occasionally, yes.	—
Outer air	„	„	„	„	None	„	„	„	„	„	No	—
„	„	„	„	„	„	„	„	„	„	„	„	—
„	Rain	„	„	Tank	House	„	„	„	„	„	Yes	—
„	Spring	„	„	Carried	Yard, water tasted badly.	No	„	„	Cellar	—	„	—
„	Rain	„	„	Tank	House	„	„	„	Dung room	—	No	—
„	„	„	„	„	Yard	„	„	„	Cellar	—	Yes	—
„	„	„	„	„	„	Yes	„	„	Cesspool	Not supplied.	„	—
„	Spring	„	„	Carried	None	„	„	„	„	„	Occasionally, yes.	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained," or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
53	F.	1 October	Vittoria, 38	Undrained	Unpaved	Good	No	Ground Floor	Clean	Not crowded	1	Terrace
75	„	26 September	„ 43	„	„	„	„	„	„	„	One vent.	Yard
2½	M.	16 August	„ 43	„	„	„	„	1st Floor	„	„	None	—
14	„	9 September	„ 51	„	„	„	—	Ground Floor	Not clean	„	1	Field
22	„	15 August	Virtù, ?	„	„	„	No	Field	Clean	„	None	—
80	F.	17 „	S. Martino, Vicolo 1°, 6	„	„	Indifferent	„	1st Floor	„	„	2	Both
33	„	18 „	Sakkaja, 21	„	„	Good	Yes	Ground Floor	Not clean	Crowded	1	Street
60	„	10 October	„ 23	„	„	„	No	1st Floor	Clean	Not crowded	1	„
72	M.	28 August	Ghariescen, 5	„	„	„	„	„	„	„	None	—
28	F.	25 „	„ 12	„	„	„	„	„	„	„	1	Yard
36	M.	11 September	„ 12	„	„	„	„	„	„	„	1	„
23	F.	22 August	„ 16	„	„	„	„	„	„	„	1	„
8	M.	28 „	„ 16	„	„	„	„	„	„	„	1	„
12	„	13 September	„ 20	„	„	„	„	„	Indifferent	„	2	Field
72	F.	31 August	„ 52	„	„	Indifferent	Yes	„	Clean	„	1	Street
64	„	24 „	Birgellun, 32	„	„	Good	No	„	„	„	2	Both
25	M.	3 September	„ Vicolo 1°, 5	„		„	„	„	„	„	1	Street
24	F.	9 August	Birel, 3	„	„	„	Yes	Ground Floor	„	„	2	Both
[illegible]	M.	13 „	„ 32	„	„	„	„	1st Floor	„	„	2	Street
[illegible]	F.	14 September	Birel, Vicolo 1°, 4	„	„	Indifferent	„	„	Not clean	„	1	Yard
16	„	2 „	„ 3°, 5	„	„	„	„	Ground Floor	„	Crowded	Two vents.	„
20	M.	19 „	„ 3°, 11	„	„	„	No	„	„	„	1	„
76	F.	9 August	„ 3°, 14	„	„	„	„	„	„	Not crowded	1	„
75	M.	7 September	„ 3°, 14	„	„	„	„	„	„	„	1	„
52	„	30 August	„ 3°, 23	„	„	„	„	1st Floor	Indifferent	„	None	—
40	F.	12 September	„ 5°, 3	„	„	„	„	Ground Floor	Not clean	Crowded	„	—
3	„	15 „	Nuova, Vicolo 1°, 1	„	„	Good	Yes	Mezzanine	Clean	Not crowded	1	Street
29	„	15 „	Vecchio Doni, 15	„	„	Indifferent	„	Ground Floor	Not clean	„	1	Yard
80	„	15 „	„ 42	„	„	„	No	1st Floor	Clean	„	2	Street
HOSPITAL OF SANTO SPIRITO.												
58	F.	30 July	—	—	—	—	—	—	—	—	—	—
15	„	25 August	—	—	—	—	—	—	—	—	—	—
SAURA'S HOSPITAL, RABATO.												
MALE DIVISION.												
72	M.	28 August										
69	„	28 „										
92	„	29 „										
74	„	30 „										
77	„	31 „										
83	„	31 „		Undrained	Unpaved	Good	Yes	Ground Floor	Clean	Not crowded	14	Street and garden.
50	„	1 September										
76	„	1 „										
86	„	3 „										
79	„	5 „										
FEMALE DIVISION.												
		24 August		Undrained	Unpaved	Good	Yes	Ground Floor	Indifferent	Not crowded	2	Field
		„										
		„		„	„	„	„	„	Clean	„	15	Field and garden.
		„										

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

	Water Supply.					House Drainage.					
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell around from Privy, Tiled, Attached, "Yes" or "No"
Outer air	Spring	Good	Sufficient	Carried	None	No	No	No	Cellar	—	Yes
Common stair	„	„	„	„	„	„	„	„	Dung room	—	Occasionally, yes.
„	„	„	„	„	„	„	„	„	„	—	„
Outer air	Rain	„	„	„	„	„	„	„	None	—	—
—	Spring	„	„	Fountain in the place.	„	„	„	„	„	—	—
Outer air	„	„	„	Carried	Yard, water brackish.	„	„	„	Dung room	—	Occasionally, yes.
„	„	„	„	„	None	„	„	Yes	„	—	Yes
„	„	„	„	„	„	Yes	„	No	Cesspool	Not supplied.	No
„	„	„	„	„	„	„	„	„	„	„	„
Common stair	„	„	„	„	„	„	„	„	„	„	Occasionally, yes.
„	„	„	„	„	„	„	„	„	„	„	„
„	„	„	„	„	„	„	„	„	„	„	„
„	„	„	„	„	„	„	„	„	„	„	„
„	„	„	„	„	„	No	„	„	Cellar	—	„
„	„	„	„	„	House empty	Yes	„	„	Cesspool	Not supplied.	Yes
Outer air	Rain	„	„	„	„	„	„	„	„	„	No
„	„	„	„	Tank	Entrance	No	„	„	Cellar	—	Occasionally, yes.
Common stair	Spring	„	„	Carried	None	Yes	„	„	Cesspool	—	Yes
Outer air	Rain	„	„	Tank	House	No	„	„	Cellar	—	Occasionally, yes.
„	„	„	„	„	Yard	Yes	„	„	Cesspool	Not supplied.	Yes
„	„	„	„	Carried	None	No	„	„	Dung room	—	„
Common stair	Spring	Brackish	„	Well	Yard	Yes	„	„	Cesspool	Not supplied.	„
„	Rain	Good	„	Tank	„	No	„	„	Dung room	—	„
„	„	„	„	„	„	„	„	„	„	—	„
Outer air	„	„	„	Carried	None	„	„	„	„	—	„
Common stair	„	„	„	„	Yard, water brackish.	„	„	„	„	—	No
Outer air	Spring	„	„	„	None	Yes	„	„	Cesspool	Not supplied.	„
Common stair	„	„	„	„	„	„	„	„	Dung room	—	Yes
Outer air	„	Brackish	„	Well	House	„	„	„	Cesspool	Not supplied.	No
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta, where

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
											State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
				Undrained	Unpaved	Good	Yes	Ground Floor	Clean	Not crowded	15	Field and garden.
			...ABILE.									
			...Pubblio?...	Undrained	Unpaved	Good	No	Over the Gate	Clean	Not crowded	3	Street
			...ga, 24 ...	"	"	"	"	1st Floor	"	"	2	"
			...icola, 4 ...	"	"	"	"	Ground Floor	Indifferent	"	None	—
			...IGRET.									
			—	Undrained	Unpaved	Good	Yes	1st Floor	Clean	Not crowded	2	Both
			MTARFA.									
62	M.	4 September	—	Undrained	Unpaved	Good	No	1st Floor	—	Not crowded	2	Garden
			CASAL ATTARD.									
40	M.	29 July	Reale, 37	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	1	Garden
60	"	10 August	Zebbug, 30	"	"	"	"	Open Yard	"	"	—	—
22	"	18 "	St. Antonio, 31	"	"	"	"	1st Floor	Indifferent	"	None	—
40	F.	27	" "	"	"	"	"	2nd Floor	Clean	"	1	Street
55	M.	22	St. Domenico, 15	"	"	"	"	Ground Floor	"	"	4 vents	Yard
4	F.	26	" "	"	"	"	"	"	"	"	"	"
40	M.	23 "	Molino, 46	"	"	"	"	Entrance	"	"	1	"
20	F.	27 "	" "	"	"	"	"	"	"	"	"	"
65	M.	22 September	Curmi, 9	"	"	"	"	1st Floor	"	"	2	Yard and terrace.
40	F.	22 "	" 26	"	"	"	"	"	Clean, damp	Crowded	3 vents	Yard
35	M.	3 October	Piazza della Chiesa, 12	"	"	"	Yes	Ground Floor	Not clean	Not crowded	1	Street
			CASAL BALZAN.									
38	M.	5 August	Reale, 29	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	1	Street
			CASAL LIA.									
5	M.	6 August	Preziosi, 1	Undrained	Unpaved	Good	No	Ground Floor	Clean	Not crowded	2	Yard
31	"	2 October	Stretta, 6	"	"	"	"	"	"	"	2	Both
70	F.	9 August	" 31	"	"	"	"	"	"	"	2	"
0	"	13 September	Reale, 1	"	"	"	"	1st Floor	"	"	3	"
10	M.	10 August	" 51	"	"	"	"	Ground Floor	"	"	1	Yard
32	"	20 "	" 71	"	"	"	"	1st Floor	"	"	4	Street, garden, and terrace.
	"	31 October	Forni, 56	"	"	"	"	Ground Floor	"	"	2	Yard
		19 September	" 58	"	"	"	"	1st Floor	"	"	2	Both
			CASAL BIRCHIRCARA.									
			Ganu, 2	Undrained	Unpaved	Indifferent	No	Entrance	Indifferent	Not crowded	1	Yard
			" 6	"	"	"	"	"	Clean	"	1	"
			" 47	"	"	Good	Yes	Ground Floor	Not clean	Crowded	2	"

Cases of Cholera occurred during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply.					House Drainage.						Remarks.
	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly." &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By "Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	
- - -	Rain	Good	Sufficient	Tank	Garden	Yes	No	No	Cesspool	By hand	Yes	—
Outer air	Spring	Good	Sufficient	Carried	None	No		No	None	—	—	—
"	Rain	"	"	"	Well water, brackish.	Yes	"	"	Cesspool	—	—	—
"	"	"	"	"	None	"	"	"	"	—	Occasionally, yes.	—
Outer air	Rain	Good	Sufficient	Tank	Without	No	No	No	Dung room	—	Yes	—
Outer air	Spring	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	No	—
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung cellar	—	No	—
"	"	"	"	"	"	"	"	"	Dung room	—	"	—
"	"	"	"	Carried	Yard, empty	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	Dung cellar	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	Yard, empty	Yes	"	"	Cesspool	—	Occasionally, yes.	—
"	"	"	"	Tank	Yard	No	"	"	Dung room	—	No	—
"	"	"	"	"	House	"	"	"	None	—	—	—
Outer air	Rain	Good	Sufficient	Carried	None	Yes	No	No	Cesspool	—	No	—
Outer air	Rain, and aqueduct.	Good	Sufficient	Tank	Yard	Yes	No	No	Cesspool	—	No	—
"	Rain	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	None	No	"	"	None	—	—	—
"	"	"	"	Tank	Entrance	"	"	"	Dung cellar	—	No	—
"	"	"	"	"	House	Yes	"	"	Cesspool, trapped.	—	"	—
"	"	"	"	"	Yard	"	"	"	Cesspool	—	"	—
"	Rain, and aqueduct.	"	"	"	Garden	"	"	"	"	—	"	—
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c. and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor, &c."	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
64	F.	24 September	Ganu, 47	Undrained	Unpaved	Good	Yes	1st Floor	Clean	Not crowded	1	Yard
5	„	27 July	Molino, 6	„	„	„	No	Ground Floor	Not clean	Crowded	2	Yard and Garden.
26	„	20 August	„ 11	„	„	„	Yes	1st Floor	Clean	Not crowded	3	Yard and Terrace.
40	„	3 September	Misida, 28	Drained	„	„	No	„	„	„	1	Yard
46	„	14 August	„ 105	„	„	„	Yes	Ground Floor	Indifferent	Crowded	1	„
25	„	14 „	„ 106	„	„	„	„	„	Clean	Not crowded	2	„
24	M.	23 September	„ 111	„	„	„	No	„	Not clean	„	1	Street
72	F.	13 August	„ 112	„	„	„	Yes	„	Clean	„	2	Both
40	M.	28 July	„ 143	„	„	„	—	—	—	—	—	—
79	„	13 August	S. Giuliano, 4	„	„	„	No	Ground Floor	Clean	Not crowded	1	Yard
75	F.	18 „	„ „	„	„	„	„	„	„	„	1	„
17	„	3 „	„ 24	„	„	„	„	„	„	„	2	„
75	„	26 „	„ 77	„	„	„	„	1st Floor	„	„	2	Street and Terrace.
1 5/12	„	30 July	„ 93	„	„	„	„	„	„	„	1	Street
60	„	11 August	„ „	„	„	„	„	„	„	„	1	Yard
75	„	31 July	„ 95	„	„	„	„	„	Indifferent	„	1	„
75	„	4 August	„ 96	„	„	„	Yes	Ground Floor	Not clean	„	2	Both
13	M.	14 „	„ 97	„	„	„	No	„	Indifferent	„	2	„
17	F.	1 „	Vicolo Sampusa, 11	Undrained	„	Indifferent	„	1st Floor	Clean	„	1	Street
45	M.	21 „	„ „	„	„	„	„	„	„	„	1	„
45	„	14 „	„ 13	„	„	„	„	„	Indifferent	„	2	Both
41	F.	4 „	„ 20	„	„	„	Yes	„	Clean	Crowded	1	Street
6	„	23 „	„ 29	„	„	Good	No	Ground Floor	Not clean	„	1	„
53	„	2 September	„ 30A	„	„	„	„	1st Floor	Clean	Not crowded	2	„
75	„	1 August	Vicolo Bazzara, 1	„	„	„	„	Ground Floor	Indifferent	„	1	Yard
6	„	2 „	„ 3	„	„	„	„	„	„	Crowded	3 vents	„
27	„	14 „	„ 44	„	„	„	Yes	„	Clean	Not crowded	1	„
16	„	7 „	„ 16	„	„	„	„	1st Floor	„	„	1	Shop
40	M.	23 „	Reale, 15	Drained	„	„	„	„	„	„	2	Street
30	F.	27 „	„ 50	„	„	„	No	„	„	„	2	Street, terrace
54	„	4 „	„ 226	„	„	„	„	„	„	„	2	Both
6	„	14 „	Dietro la Vittoria, 2	Undrained	„	Indifferent	„	Ground Floor	„	„	1	Yard
8	„	15 „	„ „	„	„	„	„	1st Floor	„	„	2	Both
33	„	17 „	„ „	„	„	„	„	„	„	„	2	„
12	M.	5 „	„ „ 7	„	„	Good	„	Yard	„	„	—	—
4	„	12 „	Vittoria, 30	„	„	Indifferent	Yes	1st Floor	Indifferent	Crowded	2 vents	Yard
2 2/12	„	27 „	„ 38	„	„	„	No	Ground Floor	Clean	Not crowded	2	Street
50	F.	3 September	Herba, 2	Drained	„	Good	„	1st Floor	„	„	1	Yard
64	„	21 August	„ 8	Undrained	„	Indifferent	„	„	Indifferent	„	1	Street
12	M.	23 „	„ 9	„	„	„	Yes	Ground Floor	Not clean	Crowded	1	Yard
14	F.	„ „	„ 11	„	„	„	No	„	Clean	Not crowded	1	„
46	„	25 „	„ „	„	„	„	„	„	„	„	1	„
2 2/12	M.	26 September	„ 19	Drained	„	Good	Occasionally, yes.	1st Floor	„	„	1	Street
44	F.	7 October	„ „	„	„	„	„	„	„	„	1	„
51	M.	7 August	„ 32	Undrained	„	„	No	„	„	„	1	„
90	F.	8 „	„ 38	„	„	Indifferent	„	Ground Floor	„	„	2	Both
	M.	9 September	„ 44	Drained	„	Good	„	1st Floor	„	„	1	Yard
		3 „	„ 45	„	„	„	„	„	„	„	1	Street
		6 August	Herba Vicola, 5	Undrained	„	Indifferent	„	„	„	„	2	Yard
		ptember	Vallone, 60	„	„	Good	Yes	Ground Floor	„	„	1	„
			„ „	„	„	„	„	„	„	„	1	„

where Cases of Cholera occurred during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	Yard, empty	"	"	"	"	—	"	—
"	Aqueduct	"	"	"	None	"	"	"	Dung cellar	—	"	—
Common stair	"	"	"	"	Yard, empty	"	"	"	Dung room	—	Yes	—
"	"	"	"	"	"	Yes	"	"	Cesspool	—	"	—
"	Rain	"	"	"	None	"	"	"	"	—	No	—
Outer air	"	"	"	Tank	Yard	No	"	"	Dung room	—	"	—
—	—	—	—	—	—	—	—	—	—	—	—	Attacked at 60, Strada S. Patrizio, Valetta.
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	None	"	"	"	Dung cellar	—	Occasionally, yes.	—
"	"	"	"	Tank	House	Yes	"	"	Sink	By hand	"	—
Common stair	"	"	"	"	Yard	No	"	"	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	"	"	"	"	"	Yes	"	"	Sink	By hand	Occasionally, yes.	—
"	"	"	"	Carried	None	No	"	"	Dung room	—	No	—
Common stair	"	"	"	"	Yard, empty	"	"	"	"	—	"	—
Outer air	"	"	"	"	Entrance, empty.	"	"	"	"	—	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	Street, empty	"	"	"	Dung cellar	—	No	—
"	"	"	"	"	None	"	"	"	"	—	Yes	—
"	"	"	"	"	"	"	"	"	None	—	—	—
Common stair	"	"	"	Tank	Yard	"	"	"	Dung cellar	—	No	—
Outer air	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	Yard, empty	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	"	—	Yes	—
"	"	"	"	"	"	"	"	"	Dung room	—	No	—
"	"	"	"	"	House	Yes	"	"	Cesspool	—	Occasionally, yes.	—
"	"	"	"	"	Yard	"	"	"	Sink	By hand	"	—
"	"	"	"	"	"	"	"	"	Cesspool	"	"	—
"	"	"	"	"	"	No	"	"	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	House	Yes	"	Yes	Cesspool	—	Occasionally, yes.	—
"	"	"	"	"	Yard	"	"	No	Sink	By hand	No	—
"	"	"	"	"	"	No	"	"	Dung cellar	—	"	—
"	"	"	"	"	"	"	"	"	Dung room	—	"	—
"	"	"	"	"	"	Yes	"	"	Sink	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	Rain and aqueduct.	"	"	Carried	Yard, empty	No	"	"	Dung room	—	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	Rain	"	"	Tank	Entrance	"	"	"	Dung cellar	—	No	—
"	"	"	"	"	Yard	"	"	"	"	—	"	—
"	"	"	"	"	"	Yes	"	"	Sink	By hand	"	—
"	"	"	"	"	Entrance	No	"	"	Dung cellar	—	"	—
"	"	"	"	"	Yard	"	"	"	"	—	"	—
Common stair	Aqueduct	"	"	Carried	Yard, empty	"	"	"	"	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c. and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c."	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded, &c."	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs. 60	F.	1865. 6 August	Vellone 64	Undrained	Unpaved	Good	No	Ground Floor	Indifferent	Not crowded	None	—
6	„	15 „	„ 68	„	„	„	„	1st Floor	Clean	„	2	Garden and terrace.
66	M.	16 „	„ 71	„	„	„	„	Ground Floor	„	„	1	Street
80	„	7 „	Mina Buzaura, 7	„	„	„	„	„	„	„	1 vent	Yard
50	F.	8 „	Ghar el Giobon, 4	„	„	„	„	„	„	Crowded	3 vents	„
35	„	14 „	„ 5	„	„	„	„	„	„	„	2	„
78	M.	20 „	„ 7	„	„	„	„	1st Floor	„	Not crowded	1	Street
42	F.	18 September	„ 15	„	„	„	„	Ground Floor	„	„	1 vent	Field
65	M.	22 October	„ 58	„	„	„	„	1st Floor	„	„	1	Street
77	„	9 August	Laxia, 3	Drained	„	„	„	Ground Floor	„	„	1	Yard
73	F.	16 „	„ „	Undrained	„	Indifferent	„	„	Indifferent	„	1	„
40	„	22 „	„ 5	Drained	„	Good	„	„	Clean	„	1	„
48	„	1 September	„ „	Undrained	„	„	„	1st Floor	„	„	2	Yard and garden.
81	M.	3 „	„ 15	„	„	Indifferent	„	„	„	„	1	Street
28	F.	19 August	„ 38	Drained	„	„	Yes	Ground Floor	Not clean	„	2	„
4	M.	20 „	„ „	„	„	„	„	„	„	„	2	„
10	„	9 „	S. Rocco, 111	„	„	Good	„	1st Floor	Clean	Crowded	1	„
56	„	17 „	„ „	„	„	„	„	„	„	„	1	„
27	F.	9 „	Vicolo Meghada, 2	„	„	Indifferent	No	„	„	Not crowded	3	Yard and terrace.
60	M.	12 „	Rigu, 21	„	„	Good	Yes	„	Indifferent	„	1	Street
23	„	10 „	„ 37	„	„	„	„	Ground Floor	Clean	„	1	Entrance
50	F.	10 „	„ „	„	„	„	No	„	„	„	1	Yard
51	M.	10 „	„ „	„	„	„	„	„	„	„	1	„
54	F.	16 „	Vicolo Biccier, 15	Undrained	„	Indifferent	Yes	„	„	Crowded	None	—
76	M.	10 „	„ 26	„	„	„	No	„	Indifferent	Not crowded	1	Yard
16	„	13 „	Vicolo Don Vestru, 6	„	„	Good	„	„	Not clean	„	None	—
38	F.	11 „	„ 12	„	„	„	„	„	Clean	„	3 vents	Yard
90	M.	11 „	Vicolo Cantur (*b*), 7	Drained	„	Indifferent	Yes	„	„	„	None	—
33	F.	13 „	Vicolo Gharghur, 8	Undrained	„	Good	No	1st Floor	„	„	2	Both
29	„	12 September	„ 33	„	„	„	Yes	Terrace	„	„	—	—
68	„	17 August	S. Giuseppe, 21	Drained	„	„	No	1st Floor	„	„	1	Street
67	„	14 „	„ 26	„	„	„	Yes	Ground Floor	Not clean	„	None	—
4	M.	19 „	Vicolo Don Perin, 29	„	„	Indifferent	„	„	„	Crowded	1 vent	Yard
30	F.	2 September	Vicolo Buierak, 18	Undrained	„	Good	No	„	„	„	1	„
53	M.	11 „	„ „	„	„	„	„	1st Floor	Clean	Not crowded	1	Street
48	F.	3 „	„ 22	„	„	„	„	„	„	„	1	„
25	M.	22 August	„ 28	„	„	„	„	Ground Floor	„	„	3 vents	Yard
45	F.	28 „	Vicolo Hassajed, 7	„	„	Indifferent	Yes	1st Floor	„	„	2	„
6	„	30 „	„ „	„	„	„	„	„	„	„	2	„
7	M.	10 September	St. Elena, 37	Drained	„	„	„	„	„	„	3	Both
60	„	8 August	Chiesa Vecchia, 23	Undrained	„	Good	„	„	„	„	1	Street
76	F.	26 „	(*a*) Sampusa, 30	„	„	„	No	Ground Floor	Not clean	„	1	Yard
76	„	4 October	(*b*) Cantur, 10	Drained	„	„	„	„	Clean	„	1	Street
CASAL ZABBAR.												
80	F.	21 August	Santa Maria, 3	Undrained	Unpaved	Good	Yes	1st Floor	Clean	Not crowded	2	Street
[illegible]	M.	6 „	„ 27	„	„	„	No	„	„	„	1	Field
[illegible]		27 July	„ 29	„	„	„	„	Ground Floor	„	„	2	Street
[illegible]		7 August	Marsascala, 2	„	„	„	„	„	„	„	1	Yard
[illegible]		„	„ „	„	„	„	„	„	„	„	1	„
[illegible]		[illegible]st	„ 8	„	„	„	„	„	„	„	1	Street

where Cases of Cholera occurred during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply. Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	House Drainage. Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes." or "No."	Remarks.
Outer air	Aqueduct	Good	Sufficient	Carried	None	No	No	No	None	—	—	—
"	"	"	"	"	Yard, empty	Yes	"	"	Cesspool	Not supplied.	No	—
"	"	"	"	"	None	No	"	"	Dung room	—	"	—
"	Rain	"	"	Tank	Yard	"	"	"	Dung cellar	—	"	—
Common stair	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	"	"	"	Carried	Yard, empty	"	"	"	Dung room	—	"	—
"	"	"	"	"	None	"	"	"	Dung cellar	—	"	—
Common stair	"	"	"	Tank	Yard	"	"	"	Dung room	—	"	—
Outer air	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	None	"	"	"	"	—	"	—
"	"	"	"	Tank	House	"	"	"	"	—	"	—
"	"	"	"	"	Yard	Yes	"	"	Cesspool	Not supplied.	"	—
"	"	"	"	"	"	No	"	"	Dung room	—	"	—
"	"	"	"	Carried	None	Yes	"	"	Sink	By hand	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	Tank	Entrance	No	"	"	Dung room	—	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	Yard	Yes	Yes	"	Cesspool	Not supplied.	No	—
"	"	"	"	"	"	"	No	"	Sink	By hand	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	"	"	Carried	Yard, empty	No	"	"	Dung cellar	—	Yes	—
Outer air	"	"	"	"	Yard, tasted badly.	"	"	"	"	—	Occasionally, yes.	—
Common stair	"	"	"	"	None	"	"	"	"	—	No	—
Outer air	"	"	"	Tank	Yard	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	—	No	—
"	Aqueduct	"	"	Carried	Yard, empty	"	"	"	None	—	—	—
"	Rain	"	"	Tank	House	Yes	"	"	Sink	By hand	No	—
Common stair	"	"	"	Carried	House, empty	No	"	"	Dung room	—	Yes	—
"	"	"	"	Tank	Yard	"	"	"	"	—	No	—
"	"	"	"	"	Entrance	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	House, empty	"	"	"	"	—	"	—
Outer air	"	"	"	"	Yard, empty	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	None	—	—	—
"	"	"	"	"	"	"	"	"	"	—	—	—
"	"	"	"	"	Entrance	"	Yes	"	Dung room	—	Yes	—
"	"	"	"	"	Yard	"	No	"	Dung cellar	—	"	—
Common stair	"	"	"	"	Partly under room.	"	"	"	"	—	"	—
Outer air	"	"	"	"	Yard	Yes	"	"	Sink	By hand	No	—
Outer air	Rain	Good	Sufficient	Tank	Yard	Yes	No	No	Cesspool	Not supplied.	No	—
"	"	"	"	"	"	No	"	"	None	—	—	—
"	"	"	"	"	"	"	"	"	"	—	—	—
"	"	"	"	"	"	"	"	"	Dung cellar	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	None	"	"	"	None	—	—	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta,

Fatal Cases of Cholera.											Windows.	
Age.	Sex.	Date of Death.	Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor, &c."	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.	M.	1865. 10 August	Marsascala 9	Undrained	Unpaved	Good	No	Ground floor	Clean	Not crowded	1	Yard
52	„	27 July	„ 10	„	„	„	Yes	„	„	„	2 vents	„
20	„	6 August	„ „	„	„	„	„	„	„	„	2	„
70	F.	29 July	„ 11	„	„	„	„	1st Floor	„	„	2	Yard and field
11	M.	5 August	„ 12	„	„	„	„	„	Not clean	„	1	Yard
44	„	29 July	„ „	„	„	„	„	„	„	„	1	„
15	„	5 August	„ 32	„	„	Indifferent	No	Ground Floor	Indifferent	„	2	Street, yard
60	„	9 „	„ 40	„	„	Good	Yes	1st Floor	Clean	„	1	Street
6	F.	29 July	Santa Domenica, 35	„	„	„	No	Ground Floor	„	„	2	Street and garden.
14	„	4 October	„ 45	„	„	„	„	„	„	„	1	Field
28	M.	3 September	„ 61	„	„	„	„	1st Floor	„	„	2	Street, yard
41	F.		„ „	„	„	„	„	Ground Floor	„	„	2	„
8	„	„	„ „	„	„	„	„	„	„	„	2	„
3	M.	30 August	San Giacomo Vicolo Clauso, 18	„	„	Indifferent	„	„	„	„	2 vents	Yard
5	„	4 „	„ 22	„	„	„	„	„	„	„	1	„
40	F.	31 „	„ 51	„	„	Good	Yes	„	Indifferent	„	2	Street, yard
77	„	16 „	„ „	„	„	„	„	„	„	„	2	„
3	„	11 „	„ 69	„	„	Indifferent	„	„	Not clean	„	1	Yard
80	M.	7 „	Vicolo Lairi, 54	„	„	„	„	1st Floor	„	„	1	Terrace
9	„	„ „	Reale, 106	„	„	Good	No	„	Clean	„	2	Both
50	F.	6 „	„ 122	„	„	„	„	Ground Floor	„	„	2	„
3	„	5 „	„ 185	„	„	„	„	1st Floor	„	„	1	Field
10	„	7 „	„ „	„	„	„	„	„	„	„	1	„
30	„	13 „	„ „	„	„	„	„	Ground Floor	„	„	1	Yard
67	„	6 „	Bajada, 43	„	„	„	„	„	„	„	1	„
30	M.	31 October	„ „	„	„	„	„	1st Floor	Indifferent	„	1	Street
19	F.	24 September	„ 47	„	„	„	„	Ground Floor	Clean	„	2	„
35	M.	12 October	„ 69	„	„	„	„	1st Floor	„	„	2	Terrace, yard
65	„	10 August	Della Chiesa, 20	„	„	—	—	—	—	—	—	—
62	F.	17 „	„ 27	„	„	Good	No	Ground Floor	Clean	Not crowded	1	Yard
72	M.	3 „	San Giuseppe?	„	„	„	Yes	„	Indifferent	„	2	Street and entrance.
50	„	24 „	Vicolo, Madonna de' Miracoli, 11	„	„	Indifferent	No	„	Clean	„	2	Both
75	F.	28 „	Vicolo, San Francesco, 14	„	„	Good	„	„	„	„	2	Garden
41	„	7 September	Biccieni Vicolo, 1°, 135	„	„	Indifferent	„	„	„	„	1	Street
35	„	23 „	„ 149	„	„	„	„	„	„	„	2	Both
2½	„	18 „	Biccieni Vicolo, 2do, 124	„	„	Bad	„	1st Floor	„	„	1	Street
40	M.	20 „	„ „	„	„	„	„	„	„	„	1	Yard
4	„	16 „	Biccieni Vicolo, 3°, 111	„	„	Indifferent	Occasionally, yes.	Ground Floor	„	„	1	„
35	F.	13 „	„ 113	„	„	Bad	No	„	„	„	2	„
37	„	20 „	„ 115	„	„	Indifferent	„	1st Floor	„	„	2	Both
43	M.	„ „	„ „	„	„	„	„	2nd Floor	„	„	1	Yard
75	F.	15 „	Nuova, 15	„	„	Good	„	Ground Floor	„	„	1	Street
22	„	30 „	„ 17	„	„	„	Occasionally, yes.	1st Floor	„	„	2	„
75	„	26 „	Vicolo Luiet, 9	„	„	„	No	Ground Floor	„	„	2 vents	Yard
42	M.	30 „	„ „	„	„	„	„	„	„	„	„	„
17	F.	28 „	Vicolo, San Vincenzo, 11	—	—	—	—	—	—	—	—	—
	„	9 October	Dietro la Chiesa, 11	Undrained	Unpaved	Indifferent	No	Ground Floor	Clean	Not crowded	1	Yard
		17 August	Dietro il Giardino, 4	„	„	Good	„	„	„	„	1	Street
			CASAL ZEITUN.									
		ust	Viccolo, San Isodoro, 7	Undrained	Not paved	Indifferent	Yes	Ground Floor	Clean	Not crowded	None	—
			„ 7	„	„	„	No	„	„	„	1	Yard

where Cases of Cholera occurred during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued*.

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply. Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient,"	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	House Drainage. Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Rain	Good	Sufficient	Carried	None	No	No	No	Dung cellar	—	No	—
"	"	"	"	"	"	"	"	"	Dung room	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	None	—	—	—
"	"	"	"	"	"	"	"	"	"	—	—	—
"	"	"	"	Carried	"	"	"	"	"	—	—	—
Common stair	"	"	"	Tank	"	"	"	"	Dung cellar	—	Yes	—
Outer air	"	"	"	"	Garden	"	"	"	None	—	—	—
"	"	"	"	"	Yard	"	"	"	"	—	—	—
Common stair	"	"	"	"	"	Yes	"	"	Cesspool	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	"	"	"	"	"	No	"	"	Dung cellar	—	"	—
Common stair	"	"	"	Carried	None	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	"	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	"	"	"	Carried	None	"	"	"	Dung room	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	"	"	"	Carried	None	"	"	"	Dung room	—	"	—
Common stair	"	"	"	"	"	"	"	"	Dung cellar	—	"	—
Outer air	"	"	"	"	Entrance, empty.	Yes	"	"	Cesspool	—	No	—
"	"	"	"	Tank	Yard	"	"	"	"	—	"	—
Common stair	"	"	"	Carried	None	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	No	"	"	Dung cellar	—	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	"	"	"	"	"	Yes	"	"	Cesspool	—	No	—
"	"	"	"	"	"	No	"	"	Dung cellar	—	"	—
—	—	—	—	—	—	—	—	—	—	—	—	Attacked on a ship anchored at the French Creek.
Outer air	Rain	Good	Sufficient	Carried	None	Yes	No	No	Cesspool	—	No	—
Common stair	"	"	"	Tank	Yard	"	"	"	"	—	Occasionally, yes.	—
Outer air	"	"	"	"	"	"	"	"	"	—	Yes	—
"	"	"	"	"	Garden	"	"	"	"	—	No	—
"	"	"	"	Carried	None	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	"	—	"	—
"	"	"	"	Carried	House, empty	"	"	"	"	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	None	"	"	"	"	—	Occasionally, yes.	—
"	"	"	"	Tank	Yard	"	"	"	"	—	No	—
"	"	"	"	"	Under house	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	None	"	"	"	"	—	"	—
"	"	"	"	Tank	Under house	"	"	"	"	—	Occasionally, yes.	—
"	"	"	"	"	Yard	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
—	—	—	—	—	—	—	—	—	—	—	—	Attacked at the Nunnery of Cospicua.
Outer air	Rain	Good	Sufficient	Carried	None	Yes	No	No	Cesspool	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Common stair	Rain	Good	Sufficient	Tank	Yard	No	No	No	None	—	—	—
Outer air		"	"	"	"	Yes	"	"	Cesspool	By hand	No	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta, where

Fatal Cases of Cholera.			Name of Street, Court, Place, &c. and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor, &c."	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs. 45	F.	1865. 16 August	Sciortino, 25	Undrained	Not paved	Indifferent	No	Ground Floor	Clean	Not crowded	2 vents	Yard
55	„	5 „	„ 39	„	„	Good	Yes	„	„	„	1 vent	„
7	„	23 „	Marsascirocco, 127	„	„	„	No	„	Not clean	Crowded	None	—
4	„	23 „	„ „ 127	„	„	„	„	„	„	„	„	—
42	„	28 „	„ 127	„	„	„	„	„	„	„	„	—
8	„	21 September	„ 133	„	„	„	„	„	Indifferent	Not crowded	2 vents	Yard
30	M.	22 „	„ 136	„	„	„	„	„	Clean	„	„	„
65	„	4 „	Santa Maria, 21	„	„	„	„	„	Indifferent	„	2	Street and room.
73	F.	12 August	„ 97	„	„	„	„	„	Clean	„	1	Street
84	M.	15 „	„ 97	„	„	„	„	„	„	„	None	—
35	F.	17 „	„ 103	„	„	„	„	„	„	„	1	Yard
80	M.	26 September	„ 164	„	„	„	„	1st Floor	„	„	2	Street
22	F.	12 August	San Michele, 10	„	„	Indifferent	„	Ground Floor	Indifferent	„	2	Street, yard
19	M.	19 „	„ 10	„	„	„	„	„	„	„	2	„
8	„	17 „	San Pietro, 12	„	„	„	„	„	„	„	3 vents	Yard
30	„	11 „	Santa Lucia, 14	„	„	Good	„	1st Floor	Clean	„	2	Street, yard
33	F.	18 „	Giardino Botanico, 21	„	„	„	„	Ground Floor	„	„	None	—
34	M.	23 „	„ „ 21	„	„	„	„	„	„	„	„	—
26	F.	23 September	„ „ 58	„	„	„	„	„	„	„	„	—
20	„	18 „	„ „ 58	„	„	„	„	„	Not clean	Crowded	„	—
7	M.	17 „	„ „ 58	„	„	„	„	„	„	„	„	—
13	F.	21 „	„ „ 58	„	„	„	„	„	„	„	„	—
50	M.	18 „	„ „ 58	„	„	„	„	„	„	„	2 vents	Yard
4	F.	17 „	„ „ 58	„	„	„	„	„	„	„	„	„
19	M.	14 „	„ „ 61	„	„	„	„	1st Floor	Clean	Not crowded	1	Street
40	F.	14 „	„ „ 61	„	„	„	„	„	„	„	1	„
38	„	2 October	„ „ 64	„	„	„	„	„	„	„	2	Garden
6	„	17 September	„ „ 70	„	„	„	Yes	Ground Floor	„	„	1	Yard
70	„	19 „	„ „ 70	„	„	„	„	„	„	„	1	„
28	M.	20 „	„ „ 70	„	„	„	„	„	„	„	2 vents	„
78	„	22 „	„ „ 70	„	„	„	„	„	„	„	„	„
26	„	19 „	Vicolo Molino, 17	„	„	„	No	„	„	„	None	—
60	„	17 „	„ „ 19	„	„	„	„	1st Floor	„	„	„	—
80	F.	17 „	„ „ 19	„	„	„	„	„	„	„	„	—
14	„	21 „	„ „ 21	„	„	„	„	Ground Floor	Not clean	„	1	Field
20	M.	18 „	Herba, 21	„	„	„	„	„	Clean	„	3	Yard
85	F.	3 October	„ 34	„	„	Indifferent	Yes	1st Floor	„	„	1	Street
52	„	20 September	„ 39	„	„	Good	No	Ground Floor	Not clean	„	2	„
5	M.	23 „	„ 40	„	„	„	„	„	Clean	„	1	Yard
33	„	11 October	„ 50	„	„	„	„	„	„	„	1	Street
11	„	2 „	Herba, Vicolo 4°, 9	„	„	Indifferent	„	„	Not clean	Crowded	None	—
75	F.	26 September	„ „ 17	„	„	„	„	„	Clean	Not crowded	2 vents	Yard
45	M.	1 October	Herba, Vicolo San Felice 7	„	„	„	Yes	„	„	„	2	„
58	„	29 September	„ „ 8	„	„	„	No	„	Indifferent	„	3	Street, yard
75	F.	19 „	San Emidio, 13	„	„	Good	Yes	„	Not clean	„	1	Yard
5	„	4 October	„ 11	„	„	„	No	„	Clean	„	1	„
M.		27 September	„ 20	„	„	„	„	1st Floor	„	„	1	Street
		17 August	Madonna della Pietà, 34	„	„	„	„	Ground Floor	„	„	1	„
		9 September	„ „ 80	„	„	„	„	„	„	„	2	Street, yard
		ugust	Barone, 9	„	„	Indifferent	„	Above ground	Indifferent	„	2	„
		ber	Concezione, 24	„	„	Good	Yes	1st Floor	Clean	„	1	Yard

Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water; "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Common stair	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	Yes	—
"	"	"	"	"	"	"	"	"	Dung room cellar.	—	"	—
Outer air	"	"	"	Carried	None	Yes	"	"	Cesspool	Not supplied.	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	"	"	Tank	Yard	No	"	"	Dung room	—	"	—
Outer air	"	"	"	"	"	Yes	"	"	Cesspool	—	"	—
"	"	"	"	"	"	No	Yes	"	None	—	—	—
"	"	"	"	"	"	"	No	"	"	—	—	—
"	"	"	"	"	"	"	"	"	"	—	—	—
"	"	"	"	"	Entrance	Yes	"	"	Cesspool	Not supplied.	Yes	—
"	"	"	"	"	Yard	No	"	"	None	—	—	—
"	"	"	"	"	Entrance	Yes	"	"	Cesspool	Not supplied.	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Yard	"	"	"	"	"	No	—
Common stair	"	"	"	Carried	Tank, under yard, empty.	"	"	Yes	"	"	Yes	—
Outer air	"	"	"	Tank	Yard	"	"	No	"	By hand Not supplied.	No	—
"	"	"	"	"	"	"	"	"	"	"	"	This man slept in the entrance.
"	"	"	"	"	Entrance	"	"	"	"	"	Yes	—
Common stair	"	"	"	"	Street	No	"	"	Dung cellar	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	"	"	"	"	Yard	Yes	"	"	Cesspool	Not supplied.	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	No	"	"	None	—	—	—
"	"	"	"	Carried	None	"	"	"	Dung cellar	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	Adjoining to a pigsty.
"	"	"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	"	"	—	"	
"	"	"	"	Tank	Yard	"	"	"	"	—	"	—
"	"	"	"	Carried	Yard, empty	Yes	"	"	Cesspool	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	Entrance	No	"	"	"	—	"	—
"	"	"	"	"	Yard	"	"	"	Dung cellar	—	No	—
"	"	"	"	Carried	None	Yes	"	"	Cesspool	—	Yes	—
"	"	"	"	"	"	No	"	"	Dung cellar	—	"	—
Common stair	"	"	"	"	Yard, empty	Yes	"	"	Cesspool	—	"	—
Outer air	"	"	"	Tank	Yard	"	"	"	"	—	No	—
"	"	"	"	Carried	None	"	"	"	"	—	"	—
Common stair	"	"	"	Tank	Yard	No	"	"	Dung cellar	—	"	—
Outer air	"	"	"	"	"	Yes	"	"	Cesspool	—	Yes	—
"	"	"	"	Carried	None	No	"	"	Dung room	—	No	—
"	"	"	"	Tank	Yard	Yes	"	"	Cesspool	—	"	—
Common stair	"	"	"	"	"	No	"	"	Dung room	—	Yes	—
Outer air	"	"	"	"	"	Yes	"	"	Cesspool	—	"	—
"	"	"	"	"	"	"	"	"	"	—	No	She slept in th
"	"	"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	No	"	"	Dung room	—	"	
"	"	"	"	"	"	Yes	Yes	Yes	Cesspool	By hand	"	

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs. 82	M.	1865. 6 September	San Domenico, 13	Undrained	Unpaved	Indifferent	No	Ground Floor	Clean	Not crowded	1	Yard
60	„	23 „	„ „ 51	„	„	Good	Yes	„	Indifferent	„	2 vents	„
66	F.	4 „	„ „ 52	„	„	„	„	„	Clean	„	„	„
48	„	29 August	Vicolo Vandonio, 20	„	„	Indifferent	No	„	„	„	2	Yard and Field
14	„	7 September	„ „ 30	„	„	Good	„	1st Floor	„	„	2	Street, yard
24	„	29 August	San Giovanni Vicolo 1°, 5	„	„	Indifferent	„	Ground Floor	„	„	1	Yard
62	M.	19 October	„ 22		„	Good	Yes	1st Floor	„	„	2	Street
6	F.	2 September	Vicolo 4to, 28		„	„	No	Ground Floor	„	„	1	Yard
19	M.	29 August	San Francesco, 19	„	„	„	„	„	„	„	1	„
78	F.	1 September	Nuova, 37	„	„	„	„	„	Not clean	„	None	—
56	„	11 October	„ 17	„	„	„	„	1st Floor	Clean	„	2	Both
45	M.	6 August	„ 36	„	„	„	„	Ground Floor	Not clean	„	None	—
58	F.	8 September	„ 37	„	„	„	„	„	„	„	None	—
6	„	10 „	Piazza Maggiore, 8	„	„	„	„	„	Clean	„	1	Street
18	M.	16 „	„ 26	„	„	„	Yes	1st Floor	„	„	1	„
80	„	18 „	Vicolo Molino, 22	„	„	—	—	—	—	—	—	—
13	„	17 „	Piazza Santa Maria, 24	„	„	Indifferent	No	Ground Floor	Clean	Crowded	1	Yard
32	„	19 „	Vicolo Alessandro, 2	„	„	Good	Yes	„	„	„	1 vent	„
48	F.	22 „	Vicolo Rondo, 2	„	„	Indifferent	No	1st Floor	„	„	None	—
80	„	8 August	Reale, 82	„	„	Good	„	Ground Floor	„	Not crowded	1	Yard
6	„	13 October	„ 100	„	„	„	„	1st Floor	„	„	3	Street, garden, yard.
70	„	13 August	Tempio, 23	„	„	„	„	Ground Floor	„	„	1	Street
12	M.	16 „	Sciiba, 5	„	„	„	„	„	Indifferent	„	1	Yard
27	F.	29 July	„ 20	„	„	„	„	„	Not clean	„	2	Street
10	M.	2 October	Vicolo Diodato, 12	„	„	Indifferent	Yes	„	„	Crowded	None	—
55	„	6 „	Sta. Cattarina, 46	„	„	—	—	—	—	—	—	—
70	F.	22 „	San Cirillo, 5	„	Indifferent	Indifferent	No	Ground Floor	Clean	Not crowded	2	Yard and Street.
36	„	17 „	„ 5	„	„	„	„	„	„	„	2	Street and Yard.
9	M.	17 September	Marsascirocco, 188	„	„	Good	„	1st Floor	„	„	2	Both
MARSASCIROCCO HARBOUR.												
36	M.	9 August	Marsascirocco, 40	Undrained	Unpaved	Indifferent	No	1st Floor	Not clean	Crowded	2	Street and field.
18	F.	15 „	„ 41	„	„	„	„	„	„	„	2	„
CASAL CURMI.												
15	M.	21 July	Mghiered	Undrained	Unpaved	Good	No	Ground Floor	—	—	—	—
65	F.	27 August	Reale, San Giorgio, 6	Drained	„	„	Yes	„	Clean	Not crowded	1	Street
4	M.	26 „	„ 109	„	„	„	No	First Floor	„	„	1	„
1½	„	26 „	„	„	„	„	„	„	„	„	1	„
83	F.	19 „	207	„	„	Indifferent	„	„	„	„	1	„
55	„	31 „	209	„	„	„	Yes	Mezzanine	Not clean	„	1	Yard
66	M.	17 „	219	„	„	Good	No	First Floor	Clean	„	2	Street
27	F.	31 „	222	„	„	Indifferent	Yes	Ground Floor	Not clean	„	1	Yard
52	M.	28 July	226	„	„	„	No	—	—	—	—	—
33	„	22 August	„ 297	„	„	Good	Yes	Ground Floor	Clean	Not crowded	1	Street
	F.	14 „	Sta. Maria, 4	„	„	„	No	„	Indifferent	„	2	Both
		17 „	„ „	„	„	„	„	„	„	„	2	„
		28 July	„ 27	„	„	„	„	„	Not clean	„	2 vents	Yard
		August	„ „	„	„	„	„	„	„	„	„	„
			Vittoria, 33	„	„	„	„	„	Indifferent	„	None	—
			„ 55	„	„	„	„	„	Clean	„	1	Yard

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply. Whence derived.	Water Supply. Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Water Supply. Quantity: "Sufficient," or "Insufficient."	Water Supply. How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Water Supply. Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	House Drainage. Whether any House Drains: "Yes," or "No."	House Drainage. Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	House Drainage. Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	House Drainage. Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	House Drainage. How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	House Drainage. Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Rain	Good	Sufficient	Tank	Yard	Yes	No	No	Cesspool	By hand	No	—
Common stair	"	"	"	Carried	None	"	"	"	Dung room	—	Yes	—
Outer air	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	No	"	"	"	—	"	—
"	"	"	"	Carried	None	Yes	"	"	Cesspool	—	No	—
"	"	"	"	Tank	Yard	"	"	"	"	—	"	—
"	"	"	"	"	"	"	Yes	"	"	—	Yes	—
Common stair	"	Somewhat brackish.	"	"	"	No	No	"	Dung cellar	—	No	—
"	"	Good	"	"	House	Yes	"	"	Cesspool	By hand	Occasionally, yes.	—
"	"	"	"	"	Yard	No	Yes	Yes	Dung cellar	—	No	—
"	"	"	"	"	House	Yes	No	No	Cesspool	By hand	"	—
"	"	"	"	"	Yard	No	Yes	"	Dung cellar	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	No	—
Outer air	"	"	"	"	"	Yes	No	"	Cesspool	—	"	—
"	"	"	"	Carried	None	"	"	"	"	—	Yes	—
—	—	—	—	—	—	—	—	—	—	—	—	This man slept in a field near Delimara.
Outer air	Rain	Good	Sufficient	Carried	Yard, empty	Yes	No	No	Cesspool	By hand	No	—
"	"	"	"	"	None	No	"	"	Dung cellar	—	Yes	—
"	"	"	"	Tank	Yard	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	Under house	Yes	"	"	Cesspool	By hand	"	—
"	"	"	"	Carried	None	No	"	"	Dung cellar	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Common stair	"	"	"	Tank	Yard	"	"	"	"	—	"	—
"	"	"	"	Carried	"	"	Yes	Yes	"	—	Yes	—
—	—	—	—	—	—	—	—	—	—	—	—	This man was a servant in the local cholera hospital, where he slept, and was attacked by the disease.
Outer air	Rain	Good	Sufficient	Tank	Yard	Yes	No	No	Cesspool	By hand	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	Tasted badly.	"	Carried	Yard, empty	"	Yes	"	"	"	Occasionally, yes.	—
Common stair	Rain	Good	Sufficient	Carried	None	No	No	No	None	—	—	—
"	"	"	"	"	"	"	"	"	"	—	—	—
—	Spring	Somewhat brackish.	Sufficient	Well	House	No	No	No	None	—	—	He slept in an enclosure on a threshing floor.
Outer air	Rain	Good	"	Tank	Behind the house.	Yes	"	"	Common privy.	By hand	No	—
"	Spring	Brackish	"	Well	Yard	No	"	"	Dung room	—	"	—
"	"	"	"	"	"	"	"	"	"	By hand	"	—
"	Rain	Good	"	Carried	Yard, water brackish.	"	"	"	"	—	"	—
"	"	"	"	Tank	House	Yes	"	"	Sink	By hand	Occasionally, yes.	—
"	"	"	"	"	Yard	"	"	"	"	"	No	—
"	Spring	Brackish	"	Well	Room	No	"	"	Dung room	—	Occasionally, yes.	—
"	"	Good	"	"	Yard	Yes	"	"	Dung cellar	—	No	—
"	Rain	"	"	Carried	Room, empty	"	"	"	Sink	By hand	Occasionally, yes.	This man slept in the public street on his cart.
"	Spring	Brackish	"	Tank	Yard	No	"	"	Dung room	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	Yard, empty	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	Rain	Good	"	Tank	Yard	"	"	"	"	—	No	—
"	"	"	"	"	Room	Yes	"	"	Sink	By hand	"	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta, where

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
1½	F.	28 August	Vittoria, 55	Drained	Unpaved	Good	No	Ground Floor	Clean	Not crowded	1	Yard
2	M.	17 „	„ 111	„	„	„	„	First Floor	„	„	1	„
19	F.	13 „	„ 127	„	„	„	„	„	„	„	1	„
44	M.	20 „	„ 153	Undrained	„	„	„	Ground Floor	Not clean	Crowded	2	Both
20	F.	15 „	„ 154	„	„	„	Yes	„	Clean	Not crowded	2 vents	Yard
18	M.	28 „	„ „	„	„	„	„	First Floor	Indifferent	„	3	Both
22	„	23 „	„ Vicolo 4°, 39	Drained	„	Indifferent	No	Ground Floor	Clean	„	2 vents	Yard
80	„	19 „	Sta. Caterina, 33	„	„	Good	„	„	Indifferent	„	3	Both
52	F.	2 „	„ 47	Undrained	„	Indifferent	Yes	„	Clean	„	1	Yard
51	„	10 „	„ 51	Drained	„	Good	No	„	„	„	1	„
31	„	30 July	„ 63	„	„	„	Yes	„	„	„	3 vents	„
3	M.	13 August	„ 90	„	„	„	„	„	„	„	None	—
45	F.	18 „	„ 92	„	„	„	„	„	„	Crowded	1	Yard
82	„	2 September	„ 120	„	„	Indifferent	„	First Floor	„	Not crowded	1	„
22	M.	7 August	Don Mario, 3	„	„	„	No	Ground Floor	Indifferent	„	1	Street
12/12	F.	9 „	„ „	„	„	„	„	First Floor	Clean	„	2	„
6	„	11 „	„ „	„	„	„	„	„	„	„	2	„
18	„	15 „	„ 8	„	„	„	„	„	„	„	None	—
2	„	7 „	„ 29	„	„	Good	„	„	„	„	2	Yard
[illegible]	„	[illegible] „	„ 35	Undrained	„	„	„	Ground Floor	„	„	1 vent	„
60	„	31 July	„ 55	Drained	„	Indifferent	Yes	„	„	„	1	Street
66	M.	23 October	„ 60	„	„	„	„	„	Not clean	„	1	Yard
40	„	6 September	Barrache, 10	„	„	Good	No	„	Indifferent	„	—	—
73	F.	31 „	„ 31	„	„	Indifferent	Yes	First Floor	„	„	—	—
50	„	10 August	„ 39	„	„	„	No	„	Clean	„	2 vents	Yard
48	„	16 „	„ 54	„	„	„	„	Ground Floor	„	„	2	Both
8	M.	17 „	„ 55	„	„	Good	„	„	Indifferent	„	1	Yard
45	F.	21 „	„ „	„	„	„	„	„	„	„	1	„
46	„	29 „	Rossa, 33	Undrained	„	„	„	„	„	„	4 vents	Both
3	M.	13 „	„ 39	„	„	„	Yes	First Floor	Clean	„	2	„
65	F.	2 „	„ 68	„	„	Bad	„	Ground Floor	„	„	None	—
3	M.	27 „	„ 89	Drained	„	Good	No	First Floor	„	„	2	Street
60	F.	1 „	„ 112	„	„	„	„	Ground Floor	„	„	None	—
18	M.	8 „	„ 118	Undrained	„	„	„	First Floor	„	„	2	Street, garden
23	F.	15 „	„ 135	„	„	Indifferent	„	„	„	„	2	Both
5	M.	26 „	„ „	„	„	„	„	„	„	„	2	„
52	F.	4 „	Vallone, 46	„	„	Good	„	Ground Floor	Not clean	„	1 vent	Yard
86	„	9 „	„ „	„	„	„	„	„	„	„	„	„
3	„	17 „	Raffaele, 55	Drained	„	„	„	„	Clean	„	1	„
28	„	5 „	„ 57	„	„	„	„	„	„	„	1	„
55	„	7 „	„ „	„	„	„	„	„	„	„	1	„
22	„	7 „	S. Pietro, 1	„	„	„	Yes	First Floor	„	„	1	Terrace
57	„	16 „	„ „	„	„	„	„	Ground Floor	„	„	2	Both
22	„	30 „	„ 3	„	„	Indifferent	„	1st Floor	„	„	2	Street
34	„	31 „	„ „	„	„	„	„	Ground Floor	„	„	1	Yard
[illegible]	„	12 „	„ 13	„	„	Good	No.	„	„	„	2	Both
[illegible]	„	19 September	„ 29	Undrained	„	Indifferent	„	„	„	„	1	Yard
[illegible]	„	[illegible]ugust	Aloisio, 9	Drained	„	Good	„	„	„	„	1	„
[illegible]	„	[illegible]mber	„ 18	„	„	Indifferent	„	„	„	„	1 vent	„
[illegible]	„	[illegible]	S. Giorgio, 14	Undrained	„	„	„	1st Floor	Indifferent	„	2 vents	„

Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Rain	Good	Sufficient	Tank	Room	Yes	No	No	Sink	By hand	No	—
„	„	„	„	„	Yard	No	„	„	Dung room	—	„	—
„	„	„	„	„	„	Yes	„	„	Sink	By hand	„	—
„	„	„	„	Carried	None	No	„	„	Dung room within the room.	—	Yes	—
Common stair	„	„	„	Tank	Yard	„	„	„	Cellar	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
Outer air	Spring	„	„	Well	Entrance	Yes	„	„	Dung room	—	No	—
„	—	Good and brackish.	„	Carried	None	No	„	„	Dung room within the room.	—	„	—
„	Rain	Good	„	Tank	Yard	„	„	„	Dung room	—	Yes	—
„	„	„	„	„	„	Yes	„	„	Cesspool	Not supplied.	No	—
„	„	„	„	Carried	None	No	„	„	Dung room	—	Yes	—
„	„	„	„	Tank	Entrance	Yes	„	Yes	Sink within the room.	By hand	Occasionally, yes.	—
„	„	„	„	„	Yard	No	„	No	Dung room	—	Yes	—
Common stair	„	„	„	„	„	„	„	„	„	—	No	—
Outer air	Spring	Brackish	„	Well	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	Rain	Good	„	Tank	„	Yes	Yes, sink	„	„	—	„	—
„	„	„	„	„	„	No	No	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	Entrance	Yes	Yes, sink	„	„	—	„	—
Common stair	„	„	„	Carried	None	No	No	„	„	—	„	—
Outer air	„	„	„	Tank	Yard	Yes	Yes, sink	„	„	—	„	—
„	Spring	Brackish	„	Carried	None	„	„	„	„	—	„	—
Common stair	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
Outer air	Rain	Good	„	„	„	No	No	„	„	—	„	—
„	„	„	„	Tank	Garden	„	„	„	„	—	Yes	—
„	„	„	„	„	Yard	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	Occasionally, yes.	—
„	„	„	„	„	„	Yes	„	„	Sink	—	Yes	—
„	„	„	„	„	Garden	No	„	„	Dung room	—	No	—
Common stair	„	„	„	„	Yard	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
Outer air	Spring	Brackish	„	Well	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	Rain	Good	„	Tank	„	Yes	Yes, sink	„	„	—	„	—
„	Spring	Brackish	„	Well	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	Tank	„	No	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
Common stair	Rain	Good	„	„	„	„	No	„	„	—	Occasionally, yes.	—
„	„	„	„	„	„	„	„	„	„	—	„	—
Outer air	„	„	„	„	„	„	„	„	„	—	No	—
„	—	Good and brackish.	„	Carried	Yard, empty	„	„	„	„	—	„	—
„	Spring	Brackish	„	Well	Yard	Yes	„	„	Sink	By hand	„	—
Common stair	„	„	„	„	„	„	„	„	„	„	Occasionally, yes.	—
Outer air	Rain	Good	„	Carried	None	No	„	„	Dung room	—	No	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained," or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
7	M.	14 August	S. Giorgio, 14	Undrained	Unpaved	Indifferent	No	1st Floor	Indifferent	Not crowded	2 vents	Yard
31	F.	16 „	„ 14	„	„	„	„	Ground Floor	Not clean	„	1	Terrace
28	M.	24 „	„ 17	Drained	„	Good	„	1st Floor	Clean	„	1	Yard
32	F.	30 „	„ 17	„	„	„	„	„	„	„	1	„
45	„	27 September	„ 45	Undrained	„	Indifferent	„	Ground Floor	Indifferent	„	3 vents	„
60	„	17 „	„ 46	„	„	Good	„	„	Clean	„	2 vents	„
30	„	20 „	„ „	„	„	„	„	1st Floor	„	„	2	Both
3	M.	29 August	Rocca, 1	„	„	„	„	„	„	„	2	Field and terrace.
3	„	24 „	„ 23	Drained	„	Indifferent	„	„	„	Crowded	2	Both
84	F.	14 „	„ 51	Undrained	„	Good	„	Ground Floor	Not clean	Not crowded	2	„
55	„	17 „	„ „	„	„	„	„	„	„	„	2	„
8	„	15 „	Piazzetta, 72	Drained	„	„	„	Mezzanine	Clean	„	2	Street
32	M.	15 „	S. Francesco, 11	„	„	„	„	1st Floor	„	„	2	Both
10	F.	16 „	S. Bartolomeo, 20	„	„	„	„	Ground Floor	„	„	1	Street
2	„	19 „	„ „	„	„	„	„	„	„	„	1	„
22	M.	28 „	„ 61	„	„	„	Yes	1st Floor	Indifferent	„	2 vents	Yard
3	F.	19 „	„ 63	„	„	„	„	Ground Floor	Not clean	„	1	Street
37	M.	23 „	S. Paolo, 16	Undrained	„	Indifferent	No	„	Indifferent	„	3 vents	Both
80	„	2 September	Don Pietro, 39	„	„	Good	„	„	Clean	„	1	Yard
22	F.	23 August	„ 51	„	„	„	„	„	„	„	2 vents	„
3	M.	25 „	„ „	„	„	„	„	„	„	„	„	„
76	F.	8 September	S. Benedetto, 62	Drained	„	„	„	„	„	„	3	„
58	„	29 August	„ 52	„		„	Yes	„	„	„	2 vents	„
			CASAL MUSTA.									
35	F.	27 July	Reale, 12	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	1	Street
3	M.	30 „	„ „	„	„	„	„	„	„	„	1	„
70	F.	6 September	„ 13	„	„	„	„	„	„	„	2	Garden
70	M.	11 „	„ „	„	„	„	„	„	„	„	2	„
51	F.	31 August	„ 161	„	„	„	„	„	„	„	2	Street
1/12	M.	2 September	„ „	„	„	„	„	„	„	„	2	„
28	F.	3 „	„ „	„	„	„	„	„	„	„	2	„
77	M.	29 July	Speranza, 53	„	„	„	„	„	Not clean	„	1	„
62	F.	5 August	S. Silvestro, 3	„	„	„	„	„	Clean	„	1	„
2 7/12	„	30 July	„ 17	„	„	„	Yes	„	Indifferent	Crowded	2	Yard
65	M.	24 August	Molino, 32	„	„	„	No	„	Clean	Not crowded	1	Street
52	F.	1 September	S. Giovanni, 26	„	„	„	„	Ground Floor	„	„	1	Entrance
59	M.	15 „	„ „	„	„	„	„	„	„	„	1	„
			CASAL NAXARO.									
22	F.	22 July	Piazza Darnino, 7	Undrained	Unpaved	Good	No	1st Floor	Indifferent	Not crowded	1	Yard
55	„	23 „	„ 7	„	„	„	„	„	„	„	1	„
80	„	17 August	Santa Lucia, 10	„	„	„	„	„	Clean	„	None	—
51	„	25 „	„ 87	„	„	„	Yes	„	„	„	2	Street
55	„	20 „	„ 148	„	„	„	No	„	Indifferent	„	1	Yard
45	M.	23 „	„ 174	„	„	Indifferent	Yes	„	„	„	1	„
63	„	27 July	„ 243	„	„	Good	No	„	Clean	„	1	Street
		7 August	Croci, 7	„	„	„	„	„	Indifferent	Crowded	1	„
		14 „	„ 36	„	„	„	„	„	Not clean	„	1	„
		„	Reale, 48	„	„	„	„	„	Indifferent	Not crowded	1	„
		„	„ 99	„	„	„	„	„	Clean	„	1	Yard
			Piazza Vittoria, 15	„	„	„	Yes	Floor in a shop	Not clean	„	1	Street

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply.					House Drainage.						Remarks.
	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	
Outer air	Rain	Good	Sufficient	Carried	None	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	"		"	"	—	"	—
Common stair	Spring	Brackish	"	Well	Yard	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	Rain	Good	"	Tank	"	"	"	"	"	—	"	—
"	"	"	"	"	"	Yes	"	"	Sink	By hand	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Field	No	"	"	None	—	—	—
"	"	Tasted badly.	"	Carried	None	Yes	"	"	Sink	By hand	No	—
"	"	Good	"	"	"	No	"	"	Dung room	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	Yes	"	"	Cesspool	Not supplied.	"	—
"	Spring	Brackish	"	Well	Yard	No	"	"	Dung room	—	"	—
"	"	"	"	"	"	Yes	Yes, sink	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	—	—	"	Carried	Yard, empty	"	"	"	"	—	"	—
"	Rain	Good	"	Tank	Yard	"	"	"	"	—	"	—
"	Spring	Brackish	"	Well	"	No	No	"	"	—	"	—
Common stair	Rain	Good	"	Tank	"	"	"	"	"	—	"	—
Outer air	Spring	Brackish	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	Rain	Good and brackish.	"	Carried	Yard, tasted badly.	"	"	"	"	—	"	—
Common stair	"	"	"	"	"	Yes	Yes, sink	"	"	—	"	—
Outer air	Rain	Good	Sufficient	Carried	Entrance, empty.	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	Entrance	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Common stair	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	"	"	"	Carried	Yard, empty	"	"	"	"	—	"	—
"	"	"	"	"	None	"	"	"	"	—	Occasionally, yes.	—
"	"	"	"	Tank	Yard	"	"	"	"	—	Yes	—
"	"	"	"	Carried	Yard, empty	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	Rain	Good	Sufficient	Carried	Yard, empty	No	No	No	Dung room	—	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Common stair	"	"	"	Tank	Yard	"	"	"	"	—	No	—
Outer air	"	"	"	Carried	Yard, tasted badly.	"	"	"	"	—	Occasionally, yes.	—
"	"	"	"	Tank	Yard	"	"	"	"	—	No	—
Common stair	"	"	"	"	"	"	"	"	"	—	Yes	—
Outer air	"	"	"	"	"	"	"	"	"	—	No	—
"	"	Brackish	"	"	"	"	"	"	"	—	Occasionally, yes.	—
"	"	Good	"	"	"	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	"	—	Yes	—
"	"	"	"	"	House	Yes	"	"	Cesspool	Not supplied.	No	—
"	"	"	"	Carried	None	No	"	"	None	—	—	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta, where

Fatal Cases of Cholera.											Windows.	
Age.	Sex.	Date of Death.	Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained," or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
58	F.	21 August	Castro, 5	Undrained	Unpaved	Good	Yes	1st Floor	Indifferent	Not crowded	3	Both
50	„	23 „	Stretta, 21	„	„	„	No	„	Clean	„	2	„
75	M.	2 September	„ 22	„	„	„	Yes	„	Not clean	„	1	Street
23	„	24 August	Via Notabile, 4	„	„	„	No	Ground Floor	Indifferent	„	2 vents	Both
46	F.	23 September	„ 9	„	„	„	Yes	„	„	Crowded	4 vents	Yard
52	M.	18 August	„ 44	„	„	„	No	1st Floor	„	Not crowded	1	Street
55	F.	18 September	Celsi, ?	,	„	„	„	„	Clean	„	1	Terrace
			CASAL ZEBBUG.									
55	F.	21 August	Siggieni, 11	Undrained	Unpaved	Good	No	Ground Floor	Clean	Not crowded	1	Street
30	„	15 September	„ 38	„	„	„	„	1st Floor	Not clean	„	1	„
53	M.	25 July	„ Vicolo, 3°, 7	„	„	Indifferent	„	Ground Floor	Clean	„	1	Yard
57	F.	9 August	„ „ „	„	„	„	„	„	„	„	1	„
27	M.	27 July	Weides, 2	„	„	Good	„	„	„	„	2	Both
38	F.	29 August	„ 13	„	„	„	„	„	„	„	2 vents	Yard
63	„	18 „	„ 44	„	„	„	„	1st Floor	„	„	1	Street
86	„	20 „	„ „	„	„	„	„	„	„	„	1	„
63	„	9 „	„ 52	„	„	„	„	Ground Floor	Not clean	„	1	„
28	„	4 „	„ 71	„	„	„	Yes	„	Indifferent	„	1	Yard
57	„	5 „	„ 73	„	„	„	No	1st Floor.	„	„	1	Street
64	„	22 „	Prima Lume, 7	„	„	„	Yes	Ground Floor (shop).	Not clean	„	1	„
42	M.	5 September	„ 22	„	„	„	„	1st Floor	Clean	„	2	Both
2 9/12	„	31 July	„ Vicolo 2°, 8	„	„	„	No	Ground Floor	Indifferent	„	1	Street
34	F.	16 August	„ „ „	„	„	„	„	„	„	„	1	„
3	„	28 „	Seconda Lume, 37	„	„	„	Occasionally, yes.	„	„	„	None	Yard
39	M.	24 „	„ 38	„	„	„	Yes	1st Floor	„	„	1	Field
68	„	25 „	„ „	„	„	„	„	Ground Floor	„	„	1	Yard
21	F.	12 „	Santa Maria, 4	„	„	„	No	„	„	„	1	„
6	M.	18 „	„ „	„	„	„	„	„	,	„	1	„
10	„	16 September	„ 50	„	„	„	„	„	Clean	„	2	„
14	„	12 August	„ 53	„	„	„	„	„	„	„	2 vents	„
32	F.	18 „	„ „	„	„	„	„	„	„	„	„	„
25	„	10 „	„ 58	„	„	„	„	„	Indifferent	„	1	„
21	„	21 „	„ 65	„	„	„	„	1st Floor	Clean	„	1	Street
45	M.	18 „	„ „	„	„	„	„	Ground Floor	Indifferent	„	2	Both
11	F.	3 „	„ Vicolo 1°, 5	„	„	„	„	„	Not clean	„	2	Yard
64	M.	5 September	Piazza Muxi, 11	„	„	„	Yes	„	Clean	„	2	Street and adjoining room.
48	„	8 „	„ 25	„	„	„	„	„	„	Crowded	1	Yard
8	„	26 August	„ 28	„	„	„	„	Ground Floor (shop).	Not clean	„	1	Street
4	F.	4 „	Piazza Vicolo 2°, 2	„	„	Indifferent	No	Ground Floor	Clean	Not crowded	1	Yard
60	M.	6 „	„ 2	„	„	„	„	„	„	„	1	„
29	F.	9 „	„ 2	„	„	„	„	„	„	„	1	„
5	M.	11 „	Reale, 136	„	„	Good	Yes	Entrance	„	„	None	Court
44	F.	3 September	„ 143	„	„	„	No	Ground Floor	Not clean	„	2	Yard
29	„	3 „	„ 161	„	„	„	„	„	Clean	„	3 vents	„
5	„	6 „	„ 172	„	„	„	„	1st Floor	„	„	1	Street
32	„	20 August	„ 179	„	„	„	„	Ground Floor	„	„	1 vent	Yard
26	„	8 „	„ 188	„	„	„	Yes	1st Floor	Indifferent	„	2	Yard and Terrace.
56	F.	15 „	„ 205	„	„	„	„	„	Clean	„	2	Both
[illegible]	„	21 „	„ 292	„	„	„	No	Ground Floor	„	„	1	Yard
[illegible]	„	9 „	Lunga, 19	„	„	„	„	1st Floor	Indifferent	„	1	Street
[illegible]	„	[illegible] „	„ „	„	„	„	„	„	„	„	1	„

Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply.					House Drainage.						Remarks.
	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	
Outer air	Rain	Good	Sufficient	Carried	None	No	No	No	Dung room	—	Yes	—
Common stair	„	„	„	Tank	Yard	„	„	„	„	—	No	—
Outer air	„	„	„	„	„	„	„	„	„	—	Yes	—
„	„	„	„	„	„	„	„	„	„	—	No	—
„	„	„	„	Carried	None	„	„	„	„	—	Yes	—
„	„	„	„	„	Yard, empty	„	„	„	„	—	No	—
„	„	„	„	„	None	„	„	„	„	—	„	—
Outer air	Rain	Good	Sufficient	Tank	Near house	No	No	No	Cellar	—	No	—
„	„	„	„	„	Entrance	„	„	„	„	—	„	—
„	„	„	„	„	Yard	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	Yes	„	„	Cesspool	Not supplied.	„	—
„	„	„	„	„	„	No	„	„	Cellar	—	„	—
„	„	„	„	„	„	„	„	„	„	—	Occasionally, yes.	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	Dung room	—	No	—
„	„	„	„	„	„	„	„	„	„	—	Occasionally, yes.	—
„	„	„	„	Carried	None	„	„	„	„	—	Yes	—
„	„	„	„	„	Yard, empty	„	„	„	None	—	—	—
„	„	„	„	„	„	„	„	„	Cellar	—	No	—
„	„	„	„	Tank	Yard	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	Occasionally, yes.	—
„	„	„	„	„	„	„	„	„	Dung room	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	House	„	„	„	Cellar	—	No	—
„	„	„	„	„	Yard	„	„	„	Dung room	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	Carried	None	„	„	„	Cellar	—	Occasionally, yes.	—
„	„	„	„	„	Garden, empty.	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	Tank	Yard	„	„	„	Dung room	—	No	—
„	„	„	„	„	„	„	„	„	„	—	Yes	—
„	„	„	„	„	„	„	„	„	Cellar	—	Yes	—
„	„	Tasted badly.	„	„	„	„	„	„	„	—	„	—
„	„	Good	„	„	„	„	„	„	„	—	Occasionally, yes.	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	Yes	„	Yes	Cesspool	Not supplied.	No	—
„	Spring	„	„	Carried	Yard, empty	No	„	No	Dung room	—	Occasionally, yes.	—
„	Rain	„	„	Tank	Yard	„	„	„	„	—	No	—
Common stair	„	„	„	„	Entrance	„	„	„	„	—	Occasionally, yes.	—
Outer air	Aqueduct	„	„	Carried	None	Yes	„	„	Cesspool	Not supplied.	„	—
„	Rain	„	„	„	Yard, empty	No	„	„	Cellar	—	Yes	—
„	„	„	„	Tank	Yard	„	„	„	„	—	No	—
„	„	„	„	„	„	„	„	„	„	—	„	—
„	„	„	„	„	„	„	„	„	Dung room	—	Occasionally, yes.	—
„	„	„	„	„	„	„	„	„	„	—	„	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained," or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
30	F.	13 August	Paris, 8	Undrained	Unpaved	Good	No	Ground Floor	Clean	Not crowded	1	Yard
49	M.	„ „	„ 38	„	„	„	„	„	„	„	1	„
1¼	„	17 „	Mamo, 16	„	„	„	„	„	„	„	1	Street
57	F.	28 „	Ebbona Vicolo, 1°, 7	„	„	„	Yes	1st Floor	„	„	1	„
76	„	10 September	Hoffra, 11	„	„	„	No	Ground Floor	Indifferent	„	2	Yard
44	„	8 „	„ 15	„	„	„	„	„	„	„	1	„
8	M.	10 „	Per la Chiesa, Vicolo, 1°, 10	„	„	Indifferent	„	„	Not clean	„	1	„
68	F.	12 „	S. Martino, Vicolo, 2°, 1	„	„	Good	„	„	Clean	„	None	—
28	„	29 „	Molino Ghodor, 3	„	„	„	„	„	Indifferent	„	1 vent	Street
24	„	25 October	„ 16	„	„	„	„	„	Clean	Crowded	„	Yard
56	„	„ „	„ „	„	„	„	„	„	Indifferent	Not crowded	2 vents	„
5	„	21 September	„ 17	„	„	„	„	„	„	„	1	„
66	„	17 „	„ 23	„	„	„	„	„	Clean	„	1	Street
42	„	15 „	„ „	„	„	„	„	1st Floor	Not clean	Crowded	2	Yard and Terrace.
78	M.	8 October	„ Vicolo 1°, 8	„	„	„	„	Ground Floor	Indifferent	Not crowded	1	Yard
73	F.	13 October	„ „	„	„	„	„	„	„	„	1	„
2 7/12	M.	17 September	Abbandonati, 13	„	„	„	Yes	1st Floor	Clean	„	1	Street
53	„	21 „	Prima Angeli, 37	„	„	„	No	Ground Floor	Indifferent	„	1	„
45	F.	11 August	Strefta, 9	„	„	„	Yes	1st Floor	Not clean	„	1	„
			VIA S. GIUSEPPE.									
20	F.	8 August	S. Giuseppe, 3	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	3	Street
26	„	11 „	„ 9	„	„	„	„	Ground Floor	„	„	1	Field
35	„	9 September	„ 19	„	„	„	„	1st Floor	„	„	2	Street
35	„	4 „	„ 21	„	„	„	„	„	„	„	2	„
35	„	17 August	„ 27	„	„	„	Yes	2nd Floor	„	Crowded	1	Yard
30	„	18 „	„ „	„	„	„	„	1st Floor	„	Not crowded	2	Court and terrace.
15	M.	20 „	„ 28	„	„	„	No	Ground Floor	Not clean	Crowded	2	Street
67	„	26 July	„ „	„	„	„	„	„	„	„	2	„
24	F.	30 August	„ 86	„	„	„	„	1st Floor	Clean	Not crowded	1	Yard
23	„	12 „	„ 217	„	„	„	„	Ground Floor	„	„	1	Terrace
23	M.	2 „	„ 220D	„	„	„	Yes	1st Floor	„	„	1	Yard
25	„	17 „	„ 240D	„	„	„	No	2nd Floor	„	„	2	Both
13	„	14 „	Dolori, 13	„	„	„	„	Ground Floor	Not clean	„	1	Yard
27	F.	12 „	Santa Venera, 2	„	„	„	„	1st Floor	Clean	Crowded	1	„
28	„	17 „	„ 8	„	„	„	„	Ground Floor	„	Not crowded	2	Both
28	„	19 „	„ „	„	„	„	„	1st Floor	„	„	1	Yard
17	„	25 July	„ 24	„	„	„	„	Ground Floor	Indifferent	Crowded	1	Street
7	M.	17 August	„ „ 33	„	„	„	„	Entrance	„	Not crowded	None	Yard
9	F.	18 „	„ „	„	„	„	„	Ground Floor	„	„	1	Street
18	M.	14 „	Marsa, 3	„	„	Indifferent	Yes	Mezzanine	—	—	—	—
5	„	31 „	„ „	„	„	„	„	„	Clean	Not crowded	1	Street
5	„	30 „	„ 7	„	„	Good	„	Ground Floor	Indifferent	Crowded	3	Both
22	F.	14 „	„ „	„	„	„	„	1st Floor	Clean	Not crowded	5	Street
45	M.	15 „	„ „	„	„	Innifferent	„	Ground Floor	Not clean	Crowded	1	„
19	„	19 September	„ „	„	„	Good	„	1st Floor	„	Not crowded	3	Street and room.
			SLIEMA.									
5	M.	17 August	Torre, 2	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	1	Street
„	„	31 July	„ „	„	„	„	„	Ground Floor	Not clean	Crowded	3	—
		9 August	„ „	„	„	„	—	—	—	—	—	—

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c., &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied,"	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	Cellar	—	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	—	No	—
"	"	"	"	"	House	Yes	"	"	Cesspool	Not supplied.	"	—
"	"	"	"	"	Entrance	No.	"	"	None	—	—	—
"	"	"	"	"	Garden	"	"	"	Dung room	—	No	—
Common stair	"	"	"	"	Yard	"	"	"	Cellar	—	Yes	—
Outer air	"	"	"	"	"	"	"	"	"	—	No	—
"	"	"	"	"	House	Yes	"	"	Cesspool	Not supplied.	"	—
"	"	"	"	Carried	Garden	No	"	"	Dung room	—	Occasionally, yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Common stair	"	"	"	Tank	Yard	"	"	"	"	—	"	—
Outer air	"	"	"	"	House	"	"	"	Cellar	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	Yard	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	Occasionally, yes	—
"	"	"	"	"	"	"	"	"	"	—	Yes	—
"	"	"	"	"	House	Yes	Yes	Yes	Cesspool	Not supplied.	"	—
"	"	"	"	"	Yard	"	No	No	"	"	"	—
Outer air	Rain	Good	Sufficient	Tank	Yard	Yes	No	No	Cesspool	By hand	No	—
"	"	"	"	Carried	None	"	"	"	"	"	Occasionally, yes.	—
"	"	"	"	Tank	Yard	"	"	"	Sink	"	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Common stair	"	"	"	"	Court	"	Yes	Yes	Cesspool	"	"	—
"	"	"	"	"	"	"	"	"	"	"	Occasionally, yes.	—
Outer air	Aqueduct	"	"	Carried	None	"	No	No	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	Rain	"	"	Tank at the back of the house.	House	"	"	"	Com. privy, trapped.	By pipe	No	—
Common stair	Aqueduct	"	"	Carried	None	"	"	"	Cesspool	By hand	"	—
Outer air	Rain	"	"	Tank	House	"	"	"	"	"	Yes	—
"	"	"	"	"	"	"	"	"	"	"	No	—
"	"	Tasted badly.	"	"	Yard	No	"	"	None	—	—	—
"	"	Good	"	"	"	Yes	"	"	Sink	By hand	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Street	No	"	"	None	—	—	—
"	"	"	"	"	Yard	"	"	"	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	By hand	"	—
"	"	"	"	Carried	None	Yes	"	"	Sink	"	"	He slept on the terrace.
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	Tank	Yard	No	"	"	Dung room	—	—	—
"	Aqueduct	"	"	Carried	None	"	"	"	None	—	—	—
"	"	"	"	"	"	"	Yes	Occasionally, yes.	Cesspool	—	Occasionally, yes.	—
"	Spring	Brackish	"	Well	House	"	No	No	None	—	—	—
Outer air	Rain	—	Sufficient	Tank	Yard	Yes	—	—	—	—	—	—
"	"	Good	"	Carried	None	No	No	No	None	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained," or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
56	F.	8 August	Marina, 51	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	3	Creek and street.
72	„	13 „	Ghar el lembi, 20A	„	„	„	„	Ground Floor	„	„	1	Garden
27	„	14 „	„ „	„	„	„	„	„	„	„	1	„
55	„	14 „	„ „	„	„	„	„	„	„	„	1	„
3	M.	15 „	Cattedrale, 20	„	„	„	„	1st Floor	„	„	1	„
60	F.	21 „	St. Antonio	„	„	„	„	„	„	„	1	Room
18	„	23 „	S. Pubblio, 2	„	„	„	„	„	„	„	2	Street
2	M.	27 „	S. Paolo	„	„	„	„	Ground Floor	Indifferent	Crowded	2	Street and garden.
25		28 „	Piazza Ghar el lembi, 19	„	„	„	„	„	Clean	Not crowded	2	Yard and field.
85	„	13 September	Reale, 44	„	„	„	„	„	Not clean	„	1	Street
45	F.	16 „	Ghar id Dud, 27	„	„	„	„	1st Floor	Clean	„	1	Yard
			CASAL ZURRICO.									
32	F.	27 July	S. Michele, 44	Undrained	Unpaved	Good	No	First Floor	Clean	Not crowded	2	Street
37	„	1 August	„ „	„	„	„	„	„	„	„	2	„
62	„	14 September	Piazza Maggiore, 40	„	„	„	„	Ground Floor	„	„	1	Yard
70	M.	21 August	Spiritosa, 17	„	„	„	„	First Floor	„	„	None	—
3	F.	26 „	Barriqri, 2	„	„	„	„	„	„	„	2	Both
50	M.	1 September	„ „	„	„	„	„	„	„	„	2	„
56	„	2 „	Nigret, ?	„	„	„	„	Entrance	Indifferent	„	1	Yard
23	F.	16 „	S. Luigi, 22	„	„	„	„	Ground Floor	Clean	„	2 vents	„
58	„	8 „	„ 23	„	„	„	„	„	Indifferent	„	2	Both
50	„	27 „	Reale, 49	„	„	„	„	„	Clean	„	1	Street
24	„	21 October	„ 62	„	„	„	„	„	Indifferent	„	1	Yard
65	M.	19 September	„ 84	„	„	„	„	„	Clean	„	2	Both
14	F.	11 November	„ 87	„	„	„	Yes	„	„	„	3	Yard
70	M.	11 September	„ 88	„	„	„	„	„	Not clean	„	2	Street
52	„	22 „	Regina, 60	„	„	„	No	„	Clean	„	1	Yard
40	„	1 October	S. Pietro, 13	„	„	„	„	„	„	Crowded	None	—
52	„	4 „	Vicolo Curvo, 4	„	„	„	„	„	„	Not crowded	„	—
52	„	17 „	Carmine, Vicolo Scozzese, 5	„	„	„	„	„	„	„	2	Both
60	„	22 „	„ „ „	„	„	„	„	„	„	„	2	Yard, entrance
10	„	22 „	„ „ „	„	„	„	„	„	„	„	2	Both
30	F.	21 „	S. Luca, 25	„	„	„	„	„	Not clean	Crowded	1	Street
8	M.	22 „	S. Bartolomeo, 28	„	„	„	Yes	„	Clean	Not crowded	1	Room
72	„	30 „	Alessandro, 4	„	„	„	No	„	„	„	1	Yard
60	F.	4 November	„ „	„	„	„	„	„	„	„	1	„
			SAN GIULIANO.									
23	M.	28 July	—	—	—	—	—	—	—	—	—	—
39	F.	15 August	Kirxa	—	—	—	—	—	—	—	—	—
34	„	16 „	Collegio	—	—	—	—	—	—	—	—	—
70	„	19 „	S. Giorgio	Undrained	Unpaved	Good	No	Ground Floor	Not clean	Not crowded	3	Both
40	M.	20 „	Carmine, 12	„	„	„	„	1st Floor	Clean	„	1	Street
14	„	23 „	Torre, 19	„	„	„	Yes	Ground Floor	„	„	1	„
			CASAL GARGUR.									
	F.	29 July	Nuovo, 19	Undrained	Unpaved	Good	No	Ground Floor	Clean	Not crowded	2 vents	Yard
		4 September	„ 25	„	„	„	Yes	1st Floor	„	„	1 and 2 vents	Street

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply.					House Drainage.						Remarks.
	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c., &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	
Outer air	Rain	Good	Sufficient	Carried	None	Yes	No	No	Sink	By hand	No	—
"	"	"	"	Tank	House	"	"	"	Common privy.	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	Carried	Garden, water not made use of.	"	"	"	"	"	Yes	—
"	"	"	"	"	Garden	"	"	"	Cesspool	"	No	—
"	"	"	"	"	Yard, empty	"	"	"	"	"	"	—
"	"	"	"	Tank	Garden	"	"	"	"	"	"	—
"	"	"	"	"	Yard	"	"	"	"	"	"	—
"	"	"	"	Carried	None	No	"	"	None	—	—	—
"	"	"	"	Tank	Yard	Yes	Yes	Occasionally, yes.	Com. privy trapped.	By hand	No	—
Outer air	Rain	Good	Sufficient	Tank	—	No	No	No	Dung room	—	No	—
"	"	"	"	"	—	"	"	"	"	—	"	—
"	"	"	"	Carried	Room, empty	Yes	"	"	Cesspool	Not supplied	"	—
"	"	"	"	"	Garden, empty	"	"	"	"	"	"	—
"	"	"	"	"	Yard, empty	No	"	"	Dung room	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	Field, empty	"	"	"	"	—	"	—
"	"	"	"	"	Yard, empty	"	"	"	"	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	No	—
"	"	"	"	"	None	Yes	Yes	Yes	Cesspool	Not supplied	Yes	—
"	"	"	"	Tank	Yard	No	No	No	Dung room	—	Occasionally, yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	Yard, empty	"	"	"	Cellar	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	Dung room	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	Cellar	—	Occasionally, yes	—
"	"	"	"	"	"	"	"	"	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	None	"	"	"	"	—	Yes	—
"	"	"	"	Tank	Yard	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
Outer air	Rain	Good	Sufficient	Tank	Enclosure	No	No	No	None	—	—	—
"	"	"	"	"	Under House	Yes	"	"	Cesspool	By hand	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	"	"	"		—	"	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
38	F.	23 August	Reale, 30	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	3	Both
9	M.	31 „	„ 40	„	„	„	„	Ground Floor	Not clean	Crowded	1	Entrance
47	„	2 September	„ „	„	„	„	„	„	„	„	1	„
56	„	24 „	Ferdinando, 15	„	„	„	—	—	—	—	—	—
			CASAL GUDIA.									
28	M.	31 July	Reale, Vicolo 7°, 120	Undrained	Unpaved	Good	No	Ground Floor	Clean	Not crowded	1	Yard
21	„	12 September	Santa Maria, Vicolo 2°, 5	„	„	„	„	1st Floor	„	„	—	—
11	„	21 „	„ „ 5	„	„	„	„	Open Passage	„	„	—	—
22	„	17 „	Annunziata, 9	„	„	„	„	1st Floor	„	„	2	Street
62	„	1 October	Via Chircop, 2	„	„	„	„	Ground Floor	Indifferent	„	2 vents	—
			CASAL AXIAK.									
44	F.	20 September	S. Filippo, 30	Undrained	Unpaved	Good	No	Ground Floor	Clean	Not crowded	None	Entrance and yard.
2	M.	21 „	„ „	„	„	„	„	„	„	„	„	„
„	F.	31 August	„ 32	„	„	„	Yes	„	„	„	2 vents	Yard
42	„	2 September	„ „	„	„	„	„	„	„	„	„	„
14	„	5 „	„ „	„	„	„	„	„	„	„	„	„
35	M.	20 October	„ 38	„	„	„	No	„	„	„	„	„
81	F.	10 August	„ 69	„	„	„	„	„	„	„	—	Both
1½	„	13 September	„ Vicolo, 1°, 6	„	„	„	„	„	„	„	None	—
60	„	18 „	„ „ „	„	„	„	„	„	„	„	„	—
30	„	„ „	„ „ „	„	„	„	„	„	„	„	„	Both
20	M.	25 „	Santa Maria, 27	„	„	„	—	—	—	—	—	—
55	„	1 October	„ „	„	„	„	—	—	—	—	—	—
52	F.	13 August	Vicolo Manderaggio, 17	„	„	„	No	1st Floor	Clean	Not crowded	2	Both
42	„	28 „	„ 20	„	„	„	Yes	Ground Floor	„	„	None	—
25	„	3 October	„ 24	„	„	„	„	„	„	„	2 vents	Yard
64	M.	4 September	Santa Maria, Vicolo 4°, 18	„	„	„	„	1st Floor	„	„	1	„
35	F.	30 October	Vicolo Concezione, 19	„	„	„	„	Ground Floor	„	Crowded	3 vents	Both
75	„	„ August	„ 30	„	„	„	No	„	„	Not crowded	1	Yard
52	„	13 „	S. Paolo, 6	„	„	„	Yes	„	„	„	2	Both
63	M.	19 September	„ 10	„	„	„	No	1st Floor	„	„	1	Street
6	F.	4 October	„ „	„	„	„	„	„	„	„	1	„
10	M.	3 „	„ 28	„	„	„	„	Open Passage	„	„	—	—
80	F.	5 „	„ 36	„	„	„	„	Ground Floor	Not clean	„	1	Street
40	M.	17 „	Chiesa, 6	„	„	„	„	1st Floor	Clean	„	3	„
			CASAL PAOLA.									
40	F.	7 August	Piazza Paola, 29	Undrained	Unpaved	Good	No	Ground Floor	Clean	Not crowded	1	Street
10	M.	12 „	„ „	„	„	„	„	„	„	„	1	„
			CASAL TARXIEN.									
63	F.	9 September	Santa Maria, 17	Undrained	Unpaved	Good	No	Ground Floor	Clean	Not crowded	3	Both
„	„	8 August	„ 25	„	„	„	Yes	1st Floor	Indifferent	„	2	„
„	„	10 November	„ 67	„	„	„	No	„	Clean	„	1	Street
„	„	15 August	Piazza Britannica, Vicolo 3°, 8	„	„	Indifferent	Yes	Ground Floor	„	„	2	Both

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No,"	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink, at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation; "Open Sink," or "Common Privy." &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No,"	Remarks.
Outer air	Rain	Good	Sufficient.	Tank	Yard	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	Cellar	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
—	—	—	—	—	—	—	—	—	—	—	—	This was a fisherman who slept on a boat at St. Paul's Bay, whence he was brought to his house, already attacked with cholera.
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	Yes	"	"	Cesspool	Not supplied	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	—	No	"	"	None	—	—	—
Outer air	Rain	Good	Sufficient	Carried	Yard, empty	Yes	No	No	Cesspool	Not supplied.	No	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	Tank	Yard	No	"	"	—	—	Yes	—
"	"	"	"	"	"	"	"	"	Cesspool	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	—	—	No	—
"	"	"	"	"	"	"	"	"	Cellar	—	"	—
"	"	"	"	"	—	"	"	"	"	—	Occasionally, yes.	—
"	"	"	"	"	—	"	"	"	"	—	"	—
"	"	"	"	"	—	"	"	"	"	—	"	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	None	—	—	—
"	"	"	"	Carried	None	Yes	"	"	Cesspool	Not supplied.	Yes	—
"	"	"	"	Tank	Yard	No	"	"	Dung room	—	"	—
"	"	"	"	"	Pigsty	"	"	"	"	—	"	—
"	"	"	"	Carried	None	"	"	"	—	—	"	—
"	"	"	"	Tank	Yard	"	"	"	Cellar	—	No	—
"	"	"	"	"	"	"	"	"	Dung room	—	Yes	—
"	"	"	"	"	Entrance	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	Yard	Yes	"	"	Cesspool	Not supplied.	Yes	—
"	"	"	"	Carried	None	"	"	"	"	"	No	—
"	"	"	"	Tank	Yard	"	"	"	"	"	Occasionally, yes.	—
Outer air	Rain	Good	Sufficient	Tank	Yard	Yes	No	No	Cesspool	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	Rain	Good	Sufficient	Tank	Yard	Yes	No	No	Cesspool	—	No	—
"	"	"	"	Carried	Yard, empty	No	"	"	None	—	—	—
Common stair	"	"	"	Tank	Yard	"	"	"	"	—	—	—
Outer air	"	"	"	Carried	None	"	"	"	Dung room	—	No	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
		1865.										
¾	M.	17 August	Piazza Britannica, Vicolo 3°, 8	Undrained	Unpaved	Indifferent	Yes	Ground Floor	Clean	Not crowded	2	Both
26	F.	18 „	„ „ 8	„	„	„	„	„	„	„	2	„
10	M.	16 „	„ „ 20	„	„	„	„	„	Not clean	„	1	Yard
11	„	25 „	Scintill, 42	„	„	Good	No	„	„	„	1	„
30	„	28 „	Skajak, 22	„	„	Indifferent	„	1st Floor	Clean	„	2	Street and terrace.
33	F.	27 „	Betta, 7	„	„	Good	Yes	„	„	„	2	„
			CASAL SIGGIEUI.									
Yrs. 70	M.	29 August	Santa Margarita, 27	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	1	Yard
39	„	10 „	„ 29	„	„	„	„	„	Indifferent	„	1 and 1 vent	„
54	„	6 October	„ 43	„	„	„	„	Ground Floor	Clean	„	1	„
6	F.	16 September	„ 55	„	„	„	„	1st Floor	„	„	2	Both
8	„	24 „	„ „	„	„	„	„	„	„	„	2	„
60	„	„ „	„ 57	„	„	„	„	„	„	„	3	Yard and terrace.
2	M.	„ „	„ 114	„	„	„	„	„	„	„	1	Terrace
45	„	3 October	„ 146	„	„	„	„	Ground Floor	Not clean (oven).	„	1	Street
83	„	16 „	Via Notabile, 2	„	„	„	„	1st Floor	Clean	„	1 vent	Yard and garden.
40	F.	22 August	S. Giovanni, Vicolo 1°, 6	„	„	Indifferent	Yes	„	Indifferent	Crowded	None	—
60	M.	31 „	„ 45	„	„	Good	No	Ground Floor	Clean	„	2 vents	Yard
90	F.	28 „	„ „	„	„	„	„	„	„	„	„	„
60	„	13 September	„ „	„	„	„	„	„	„	„	„	„
23	„	15 „	„ „	„	„	„	„	„	„	„	„	„
70	„	18 „	„ 24	„	„	„	„	1st Floor	„	Not crowded	2	„
60	„	24 „	„ 26	„	„	„	„	„	„	„	2	„
35	M.	25 „	„ „	„	„	„	„	„	„	„	2	„
¾	„	22 „	„ 28	„	„	„	„	Ground Floor	„	„	1	„
32	„	18 October	„ 34	„	„	„	„	1st Floor	„	„	2	Street
90	F.	20 September	„ 35	„	„	„	„	Ground Floor	„	„	1	„
27	M.	13 „	S. Giovanni, Vicolo 2°, 1	„	„	„	„	1st Floor	„	„	1	Garden
26	F.	18 „	„ „	„	„	„	„	„	„	„	1	„
4	M.	11 August	S. Giacomo, 20	„	„	„	„	„	„	„	1	Yard
83	F.	28 September	Reale, Vicolo el Kejet, 28	„	„	„	„	„	„	„	2	Street
30	M.	13 „	„ 30	„	„	„	„	„	„	„	1 and 1 vent	Street, yard.
83	F.	25 „	„ 31	„	„	„	„	Ground Floor	„	„	1	Yard
50	„	18 „	„ 111	„	„	„	„	Mezzanine	„	„	1	Street
60	M.	14 „	Seconda Ramia, 16	„	„	„	„	Ground Floor	Indifferent	„	1	„
2	F.	19 „	„ „	„	„	„	„	„	„	„	1	„
55	M.	23 August	„ 29	„	„	„	„	1st Floor	Not clean	„	2	Yard and garden
60	F.	16 September	Parrocchiale, 5	„	„	„	„	„	Clean	„	1	Street
33	M.	17 October	„ 10	„	„	„	Yes	Wooden Floor in a shop.	„	„	1	„
40	F.	18 „	„ „	„	„	„	„	„	„	„	1	„
73	„	19 August	„ 44	„	„	„	No	Ground Floor	Not clean	„	1	„
4	„	12 September	Di Mezzo, Vicolo 4°, 5	„	„	„	„	„	Clean	„	2	Both
20	„	18 „	„ „	„	„	„	„	„	„	„	None	—
56	„	2 October	„ 10	„	„	„	„	1st Floor	„	„	2	Street
2½	„	30 August	Piazza S. Nicolo, Vicolo 1°, 5	„	„	„	„	Ground Floor	Indifferent	„	2 vents	Yard
65	„	24 September	Molino, 42	„	„	„	„	„	„	„	None	—
	M.	17 October	Nuova, 42	„	„	„	„	1st Floor	Clean	„	2	Both
		20 „	Parroco, 14	„	„	„	Yes	„	„	„	2	Street

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good." "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Rain	Good	Sufficient	Carried	None	No	No	No	Dung room	—	No	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	Tank	Yard	Yes	,,	,,	Cesspool	—	Occasionally, yes.	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	No	—
,,	,,	,,	,,	,,	,,	No	,,	,,	None	—	—	—
,,	,,	,,	,,	,,	,,	Yes	,,	,,	Cesspool	—	Yes	—
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	No	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Dung cellar	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	Carried	Yard, empty	Yes	,,	,,	Cesspool	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	Tank	Yard	No	,,	,,	Dung room	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Dung cellar	—	,,	—
,,	,,	,,	,,	Carried	None	,,	,,	,,	Dung room	—	Occasionally, yes.	—
,,	,,	,,	,,	Tank	Yard	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	No	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Dung cellar	—	,,	—
,,	,,	,,	,,	,,	House	,,	,,	,,	Dung room	—	Occasionally, yes.	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Dung cellar	—	,,	—
,,	,,	,,	,,	Carried	None	,,	,,	,,	,,	—	No	—
,,	,,	,,	,,	Tank	House	,,	,,	,,	Dung room	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	,,	Entrance	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	Carried	None	,,	,,	,,	Dung cellar	—	Occasionally, yes.	—
,,	,,	,,	,,	,,	Yard, empty	,,	,,	,,	Dung room	—	Yes	—
,,	,,	,,	,,	,,	House, water tasted badly.	,,	,,	,,	None	—	—	—
,,	,,	,,	,,	Tank	Yard	,,	,,	,,	Dung cellar	—	No	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	,,	Entrance	,,	,,	,,	Dung room	—	Occasionally, yes.	—
,,	,,	,,	,,	Carried	Yard, empty	,,	,,	,,	,,	—	No	—
,,	,,	,,	,,	,,	None	,,	,,	,,	Dung cellar	—	Yes	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
Common stair	,,	,,	,,	Tank	Yard	,,	,,	,,	Dung room	—	No	—
Outer air	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—	,,	—
,,	,,	,,	,,	,,	,,	Yes	,,	,,	Cesspool	—	,,	—
Common stair	,,	,,	,,	,,	,,	No	,,	,,	Dung room	—	,,	—
Outer air	,,	,,	,,	,,	Room	,,	,,	,,	None	—	—	—
,,	,,	,,	,,	,,	House	,,	,,	,,	Dung cellar	—	No	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	None	—	—	—

TABLE XIX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Malta,

Fatal Cases of Cholera.											Windows.	
Age	Sex.	Date of Death.	Name of Street, Court, Place, &c. and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	State No. in affected Room.	State whether the Windows open into a "Street," "Court." or "both."
			CASAL CRENDI.									
Yrs. 21	F.	1865. 9 August	Angolo, 9	Undrained	Unpaved	Good	No	Ground Floor	Not clean	Not crowded	None	—
25	M.	30 September	Parrocchiale, 15	"	"	"	"	"	Indifferent	Crowded	1	Street
			CASAL LUCA.									
28	M.	1 October	Britannica, 54	Undrained	Unpaved	Indifferent	No	Ground Floor	Clean	Crowded	None	—
52	"	8 September	" 63	"	"	Good	"	1st Floor	"	Not crowded	1	Garden
26	F.	9 October	St. Andrea, 20	"	"	"	"	"	"	"	1	Yard
28	"	15 September	" 60	"	"	"	"	Ground Floor	"	"	3	Both
9	M.	19 September	San Andrea, 62	"	"	"	"	"	"	"	2 vents	Yard
1½	"	" "	" "	"	"	"	"	"	"	"	"	"
53	"	17 October	" 73	"	"	"	"	1st Floor	"	"	2	"
46	F.	24 September	Carmine, 62	"	"	"	"	"	Not clean	Crowded	1	Street
74	"	27 "	" "	"	"	"	"	"	"	"	1	"
55	M.	20 "	" 158	"	"	"	"	"	Clean	Not crowded	1	"
10	F.	20 October	" 175	"	"	Indifferent	"	Ground Floor	Not clean	Crowded	1	Yard
60	"	24 September	S. Giorgio, 24	"	"	Good	"	1st Floor	Clean	Not crowded	2	Street and open passage.
52	M.	22 "	" 36	"	"	"	"	Ground Floor	"	"	2 vents	Yard
50	"	1 October	" "	"	"	"	"	1st Floor	"	"	1	Garden
54	"	6 "	Parrocchiale, 40	"	"	Bad	"	Ground Floor	Not clean	"	2	Both
35	"	6 "	Piazza Chiesa, 43	"	"	Indifferent	"	"	"	Crowded	1	Yard
			MELLEHA.									
22	F.	12 August	Parrocco, 8	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	2	Street
27	M.	20 September	Piazza Melleha, 14	"	"	"	"	Ground Floor	"	"	"	"
			ST. PAUL'S BAY.									
3	M.	15 August	Chiesa, ?	Undrained	Unpaved	Good	No	Ground Floor	Clean	Not crowded	2	Street
			CASAL SAFI.									
40	F.	19 October	S. Paolo, 6	Undrained	Unpaved	Good	No	Ground Floor	Clean (damp).	Crowded	None	—
5	"	10 "	S. Giuseppe, Vicolo 1°, 2	"	"	"	"	1st Floor	Clean	Not crowded	"	—
2½	M.	14 "	" 22	"	"	"	Yes	Ground Floor	Not clean	"	1	Yard
			CASAL CHIRCOP.									
75	F.	17 August	Vicolo S. Andrea, 3	Undrained	Unpaved	Good	Yes	Ground Floor	Indifferent	Not crowded	None	—
			CASAL DINGLI.									
44	M.	28 August	Concezione, 7	Undrained	Unpaved	Good	Yes	1st Floor	Clean	Crowded	1	Field

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply.					House Drainage.						Remarks.
	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," "Common Privy," &c., &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	
Outer air	Rain	Good	Sufficient	Carried	Yard, empty	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	"	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	No	—
"	"	"	"	Carried	Yard, empty	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	Yes	"	"	Cesspool	—	"	—
"	"	"	"	Carried	None	No	"	"	Dung cellar	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	House	Yes	"	"	Cesspool	—	No	—
"	"	"	"	"	"	No	"	"	Dung room	—	"	—
"	"	"	"	"	"	"	"	"	"	—	Yes	—
Common stair	"	"	"	"	Entrance	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	"	"	"	"	Room	"	"	"	"	—	"	—
"	"	"	"	"	Yard	"	"	"	None	—	—	—
Outer air	Spring	Good	Sufficient	Carried	None	No	No	No	Dung room	—	No	—
"	Rain	"	"	"	"	"	Yes	Yes	None	—	—	—
Outer air	Spring	Good	Sufficient	Tank	House	Yes	No	No	Coin. privy, trapped.	By hand	No	—
Outer air	Rain	Good	Sufficient	Carried	None	No	No	No	None	—	—	—
"	"	"	"	Tank	Entrance	Yes	"	"	Cesspool	—	No	—
"	"	"	"	Carried	Yard, empty	No	"	"	Dung room	—	Yes	—
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	Yes	—
Common stair	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	Yes	—

TABLE XX.—STATISTICAL RETURN showing the SANITARY CONDITION of DWELLINGS in VILLAGES of GOZO,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c. and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "GroundFloor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceiling, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
			CASAL XEUCHIA.									
Yrs.		1865.										
17	F.	24 July	Santa da Cianga, 5	Undrained	Unpaved	Yard, indifferent.	No	1st Floor	Clean	Not crowded	2	Yard & garden,
47	„	30 „	„ 18	„	„	„	„	„	„	„	4 vents 1	yard & terrace. Garden
66	„	26 „	„ 22	„	„	—	„	„	Not clean	„	1	Street, yard
32	„	26 „	Sansun, 2	„	„	—	„	„	Clean	„	2 vents 1	„
54	„	31 „	Chiesa, 24	„	„	Good	„	Ground Floor	„	„	1 vent 2 vents	Yard
3	„	31 „	Santa Teodora, 11	„	„	„	„	„	Indifferent	Crowded	„	„
15	„	5 August	„ „	„	„	„	„	„	„	„	„	„
10	„	31 July	S. Giovanni, 21	„	„	Yard, indifferent.	„	„	„	„	„	„
24	M.	28 „	Santa Maria, 8	„	„	—	—	—	—	—	—	—
35	F.	7 August	Santa Caterina, 51	„	„	Good	No	1st Floor	Clean	Not crowded	3	Both and garden.
90	„	13 „	San Pubblio, 9	„	„	„	„	„	„	„	5 vents	Garden and yard.
40	„	23 „	Hanzira, 60	„	„	„	„	„	Indifferent	Crowded	1	Street, yard
15	M.	24 „	Hamsin, 14	„	„	„	„	Ground Floor	„	„	2 vents 4 vents	Both
365	F.	1 September	Baccari, 7	„	„	Yard, indifferent.	„	1st Floor	Clean	Not crowded	2	Street and garden.
70	„	2 „	„ „	„	„	„	„	„	„	„	2	„
30	„	25 August	„ 8	„	„	Good	„	„	„	„	3	Both and garden.
70	„	25 „	Gharùs, 2	„	„	„	„	Ground Floor	Indifferent	„	3 vents	Both
60	„	14 September	Reale, 6	„	„	Yard, bad	—	1st Floor	Clean	„	2	„
			RABATO.									
64	M.	5 August	Via Garbo, 49	Undrained	Unpaved	Good	Yes	1st Floor	Clean	Not crowded	4	Both
8	F.	8 „	„ „	„	„	„	„	„	„	„	„	„
16	„	28 „	„ „	„	„	„	„	„	„	„	„	„
70	M.	8 „	Wairingi, 10	„	„	„	No	„	„	„	„	„
59	„	15 „	„ 30	„	„	„	Yes	Ground Floor	Not clean	Crowded	2 vents	Street
50	F.	25 „	„ 46	„	„	„	?	„	Clean	Not crowded	2	„
28	F.	15 September	„ 48	„	„	„	No	„	„	„	2	„
41	M.	19 August	Monti di Pieta	„	„	„	„	„	„	„	3	Street, terrace, and hospital corridor.
40	„	23 „	Conservatorio, 34	„	„	„	„	„	Not clean	„	None	—
64	„	9 „	„ 44	„	„	„	„	„	Clean	„	1	Field
6	„	4 September	„ 45	„	„	„	„	„	Indifferent	Crowded	None	—
1½	„	11 „	„ „	„	„	„	„	„	„	„	„	—
80	F.	17 August	„ 63	„	„	„	„	1st Floor	Clean	Not crowded	1	Street
45	M.	9 „	Fontana, 100	„	„	Bad	Yes	„	Not clean	Crowded	1	„
65	„	9 „	Castello, 7	„	„	Good	No	„	Clean	Not crowded	1	„
67	F.	7 September	„ 19	„	„	„	„	„	„	„	1	Yard
35	M.	9 August	Assunta, 17	Drained	„	Yard, bad	„	„	Indifferent	Crowded	2	Both
35	„	24 „	„ „	„	„	„	„	„	„	„	2	„
50	„	2 September	„ 27	„	„	„	„	„	Clean	Not crowded	2	„
29	„	6 August	„ 38	„	„	Good	Yes	Ground Floor	Indifferent	Crowded	1 vent	Street
75	„	6 September	„ „	„	„	„	„	„	„	„	„	„
50	„	2) August	Carità, 8	„	„	„	No	1st Floor	Clean	Not crowded	2	„
[illegible]	M.	„	„ 20	„	„	„	„	„	„	„	2	Yard and terrace.
[illegible]	[illegible]	11 „	„ 37	„	„	„	„	„	„	„	1	Yard
[illegible]	[illegible]	2 September	„ 47	„	„	Yard, bad	Yes	„	Indifferent	„	2	Both

where CASES of CHOLERA occurred, during the EPIDEMIC of 1865 (prepared by Dr. Ghio).

	Water Supply,					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	REMARKS.
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	—	Dung room	Not supplied.	No	—
"	"	"	"	"	Garden	"	"	No	"	"	Occasionally, yes.	—
"	"	"	"	"	Yard	"	"	"	"	"	Yes	—
"	"	"	"	"	"	"	"	"	"	"	No	—
"	"	"	"	Carried	None	"	"	"	"	"	"	—
"	"	"	"	Tank	Yard	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	None	"	"	"	None	—	—	—
"	"	"	"	Tank	Yard	"	"	"	Dung room	—	No	—
"	"	"	"	Carried	"	"	"	"	"	—	"	—
"	"	"	"	Tank	"	"	"	"	"	—	"	—
"	"	"	"	"	Garden	"	"	"	"	—	"	—
"	"	"	"	Carried	None	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	"	—	"	—
Outer air	Rain	Tasted badly.	Sufficient	Tank	Yard	No	No	No	Dung room	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	Cellar	—	"	—
"	Aqueduct	Good	"	Carried	None	"	"	"	Dung cellar	—	No	—
Common stair	"	"	"	"	Yard, empty	"	"	"	"	—	Yes	—
Outer air	"	"	"	"	None	"	"	"	"	—	Occasionally, yes.	—
"	Rain	"	"	Tank	Under room	"	"	"	None	—	—	—
"	"	"	"	"	Yard	"	"	"	"	—	—	—
"	"	"	"	Carried	None	"	"	"	"	—	—	—
"	"	"	"	Tank	Yard	Yes	"	"	Cesspool	—	No	—
"	"	"	"	"	"	No	"	"	Dung room	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Common stair	Aqueduct	"	"	Carried	Yard, empty	"	"	"	"	—	Yes	—
Outer air	"	"	"	"	None	"	"	"	"	—	"	—
Common stair	Rain	"	"	Tank	Yard	"	"	"	Dung cellar	—	No	—
Outer air	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	Dung room	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	Aqueduct	"	"	Carried	Yard	"	"	"	Dung cellar	—	"	—
"	"	"	"	"	Garden	Yes	"	"	Cesspool	—	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	Rain	"	"	Tank	Yard	"	"	"	"	—	No	—
Common stair	"	"	"	"	Under house	"	"	"	Sink	By hand	Occasionally, yes.	—
Outer air	Aqueduct	"	"	Carried	None	"	"	"	Dung room	—	No	—
"	"	"	"	"	Yard, empty	"	"	"	Cesspool	—	"	—

TABLE XX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Gozo,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition f Street or Court: "Good," "Indifferent," or Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
23	M.	2 September	Carita, Vicolo 2°, 97	Drained	Indifferent	Indifferent	Yes	1st Floor	Clean	Not crowded	2	Street and terrace.
30	F.	29 August	Arciprete, 4	"	Unpaved	Good	No	"	"	"	1	Street
75	"	12 "	" 10	"	"	Indifferent	Yes	"	Not clean	Crowded	3	Both
46	M.	11 "	" 17	"	"	"	No	"	Clean	Not crowded	2	"
40	F.	4 September	" 32	"	"	Yard, bad	Yes	"	Not clean	Crowded	1	Terrace
18	"	5 "	" "	"	"	"	"	"	"	"	1	"
55	"	26 August	" 35	"	"	Indifferent	"	"	Clean	Not crowded	2	Street
6	M.	17 "	" 41	"	"	"	"	"	"	Crowded	1	Garden
50	F.	16 "	" 50	"	"	"	No	"	"	Not crowded	1	Yard
70	M.	12 "	" 68	"	"	Good	"	Entrance	"	"	None	—
30	F.	13 "	" 70	"	"	"	"	1st Floor	"	"	1	"
60	"	12 "	Belligha, 22	Undrained	"	"	"	"	"	"	2	Field
40	"	16 "	Piazza Sn. Agostino, 10	Drained	"	"	"	"	"	"	1	Yard
67	"	24 "	" " 14	"	"	"	"	"	"	"	1	Street
10	M.	12 "	" " 15	"	"	"	"	"	Indifferent	"	1 vent	Yard
66	"	16 "	" " 19	"	"	"	Yes	Ground Floor	Clean	"	2 vents	"
78	"	14 "	S. Giovanni, 18	"	"	"	"	"	Not clean	"	None	—
60	"	15 "	Nuova, 18	"	"	"	No	1st Floor	Clean	"	2	Both
14	F.	3 September	" "	"	"	"	"	"	"	"	2	"
78	"	14 August	" 35	"	"	"	"	Ground Floor	Not clean	"	1	Street
31	M.	26 "	Ghain Katet, 8	Undrained	"	"	"	1st Floor	Indifferent	"	1	Garden
30	F.	29 "	" " 14	"	"	"	—	"	Clean	"	1	"
80	"	5 September	" " "	"	"	"	—	"	"	"	1	"
40	"	23 August	" " 27	"	"	"	Yard, bad	"	"	"	1	Field
1	F.	20 August	" " 45	"	"	"	No	Ground Floor	"	"	5 vents	Yard and garden.
54	"	25 "	" " 52	"	"	Yard indifferent.	"	1st Floor	"	"	1	Street
58	"	28 "	" " "	"	"	"	"	"	"	"	1	"
4	M.	8 September	Mercato, 5	Drained	"	Good	"	"	"	"	2	"
60	F.	17 August	Via Zebbug, 20	Undrained	"	Yard, bad	Yes	"	"	"	1	"
0 days	"	24 September	Manderaggio, 7	Drained	"	Indifferent	"	"	Indifferent	"	2	Yards
64	"	9 August	" 11	"	"	—	No	"	Clean	"	1	Yard
60	"	2 September	" 28	"	"	Bad	"	Ground Floor	Not clean	"	2	Street
53	M.	14 August	" 37	Undrained	"	"	"	1st Floor	"	Crowded	—	Yard
80	F.	20 "	" 39	"	"	"	"	"	"	Not crowded	1	"
40	M.	1 September	" 45	Drained	"	"	"	"	"	Crowded	1	Street
80	F.	22 August	Stretta, 15	Undrained	"	Good	"	"	Clean	Not crowded	1	Open passage
6	"	5 September	" 22	"	"	"	"	2nd Floor	"	"	1	Street
35	"	9 "	" "	"	"	"	"	1st Floor	"	"	2	"
3	"	13 "	" "	"	"	"	"	"	"	"	2	"
30	M.	22 August	Via Kerum, 4	"	"	"	"	"	Indifferent	Crowded	2	Both
50	F.	22 "	Providenza, 14	"	"	Indifferent	Yes	"	Clean	Not crowded	3	"
55	"	24 "	S. Giorgio, Vicolo, 62	"	"	"	No	Ground Floor	"	"	2	Yard
63	M.	24 September	Piazza Sta. Sabina, 22	Drained	"	Yard, indifferent	"	1st Floor	"	"	2	"
67	"	25 August	" 24	"	"	Good	"	"	"	"	4	Both
7	F.	20 "	Dietro St. Agostino, 14	Undrained	"	"	"	"	"	"	1	Street
40	"	30 "	" " "	"	"	"	"	"	"	"	1	"
14	"	12 September	Biblioteca, 30	Drained	"	"	"	"	"	"	2	"
8	M.	13 "	Pieta, 49	"	Paved	"	Yes	"	Indifferent	"	2	"
41	F.	20 August	Porta Reale, 11	Undrained	Unpaved	—	—	Ground Floor	Clean	"	None	—
			Bein it-tfali ?	"	"	Entrance, bad	Yes	1st Floor	"	"	2	Both

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply.					House Drainage.						Remarks.
	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	
Common stair	Rain	Good	Sufficient	Tank	Yard	Yes	Yes	No	Yes	Not supplied.	No	Died at 57, Strada Chiesa, Casal Garbo.
Outer air	"	"	"	"	"	"	No	"	Sink	By hand	"	—
"	Aqueduct	"	"	Carried	None	"	Yes	Yes	Cesspool	—	"	—
"	Rain	"	"	Tank	Yard	"	No	No	"	—	"	—
"	Aqueduct	"	"	Carried	Yard, water brackish.	No	"	"	Dung cellar	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	Rain	"	"	Tank	Entrance	Yes	"	"	Cesspool	Not supplied	"	—
"	"	"	"	"	Yard	"	Sink in affected room.	"	"	By hand	Occasionally, yes.	—
"	"	"	"	"	"	No	No	"	Dung room	—	No	—
"	"	"	"	"	Entrance	"	"	"	Dung cellar	—	"	—
"	Aqueduct	"	"	Carried	None	Yes	"	"	Sink	By hand	"	—
"	Rain	"	"	"	"	No	"	"	Dung room	—	"	—
Common stair	Aqueduct	"	"	"	Entrance, water bad.	"	"	"	Dung cellar	—	"	—
Outer air	Rain	"	"	"	Yard, empty	"	"	"	"	—	Occasionally, yes.	—
Common stair	Aqueduct	"	"	"	Yard, water bad.	"	"	"	"	—	No	—
Outer air	Rain	"	"	Tank	Yard	"	Open gulley.	"	"	—	Yes	—
"	"	"	"	Carried	None	Yes	—	Yes	Cesspool	—	"	—
"	"	"	"	Tank	Entrance	"	No	No	"	—	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	Under room	"	"	"	Sink	By hand	No	—
"	Aqueduct	"	"	Carried	Under house, empty.	No	"	"	Dung cellar	—	"	—
"	"	"	"	"	Yard, water bad.	"	"	"	Dung room	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	None	"	"	"	Dung cellar	—	Yes	—
Outer air	Rain	"	"	Tank	Yard	"	"	"	Dung room	—	No	—
"	"	"	"	"	"	Yes	"	"	Cesspool	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	Yard, water bad.	No	"	"	Dung room	—	Yes	—
"	"	"	"	Tank	Yard	"	"	"	Stable	—	"	—
"	"	"	"	Carried	Yard, water brackish.	Yes	"	"	Cesspool	—	No	—
"	Aqueduct	"	"	"	None	No	"	"	Dung room	—	Yes	—
Common stair	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	"	"	"	"	Yard, near house.	"	"	"	Corner of yard.	—	"	—
"	"	"	"	"	Yard, water brackish.	Yes	"	"	Cesspool	—	No	—
"	Rain	"	"	Tank	Under house	"	"	"	"	Not supplied.	"	—
"	Aqueduct	"	"	Carried	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	None	No	"	"	Dung cellar	—	"	—
"	"	"	"	"	"	"	"	"	Dung room	—	Yes	—
"	Rain	Brackish	"	Tank	Yard	"	"	"	Dung cellar	—	No	—
"	Aqueduct	Good	"	Carried	Yard, water bad	"	"	"	Dung room	—	"	—
"	Rain	"	"	Tank	Yard	Yes	"	"	Cesspool	—	"	—
"	Aqueduct	"	"	Carried	Under house	No	"	"	Dung room	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	Yard empty	Yes	"	"	Cesspool	Not supplied	"	—
"	Rain	"	"	Tank	Yard	"	"	"	"	"	Yes	—
"	Aqueduct	"	"	Carried	None	No	"	"	None	—	—	—
"	Rain	"	"	"	"	"	"	"	"	—	—	—

TABLE XX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Gozo,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
			CASAL CACCIA.									
Yrs.		1865.										
23	F.	23 September	Chiesa, 1	Undrained	Unpaved	Good	No	Ground Floor	Indifferent	Crowded	2	Both
60	M.	15 „	„ 35	„	„	„	„	1st Floor	Clean	Not crowded	1	Street
24	F.	23 „	„ „	„	„	„	„	„	„	„	2	„
78	„	4 August	„ 39	„	„	„	„	Ground Floor	„	Crowded	3 vents	Both
56	M.	16 October	„ 72	„	„	Yard indifferent	„	1st Floor	„	Not crowded	2	„
60	F.	13 September	Spiera, 7	„	„	„	„	„	„	„	1	Garden
19	„	18 „	„ 12	„	„	„	„	„	„	„	3 vents	Yard
23	„	16 „	„ 18	„	„	Good	„	„	„	„	2	Street
36	„	19 „	Piazza Chiesa, 8	„	„	„	Yes	1st Floor	„	„	—	„
48	M.	3 October	„ „	„	„	„	„	Ground Floor	„	„	1	„
68	„	25 September	„ 35	„	„	„	No	1st Floor	„	„	2	Open passage
22	F.	21 „	S. Giuseppe, 7	„	„	Indifferent	„	„	„	„	1	Field
40	„	26 „	Tal Ghjun, 9	„	„	Good	„	Ground Floor	Not clean	„	None	—
9	M.	3 October	Bullara, 3	„	„	„	„	1st Floor	„	Crowded	1	Garden
55	M.	12 October	„ 5	„	„	„	„	Ground Floor	Clean	Not crowded	1	„
18	F.	16 „	„ „	„	„	„	„	„	„	„	2 vents	Yard
65	M.	26 September	„ 12	„	„	„	„	1st Floor	„	„	1	Field
38	„	7 October	„ 16	„	„	„	„	„	„	„	2	Garden and terrace.
¼	„	10 „	„ 17	„	„	„	„	„	„	„	2	Street and field.
63	„	11 „	„ 18	„	„	Yard, indifferent.	?	„	„	„	4 vents	Garden and yard.
50	F.	29 September	„ 19	„	„	„	No	Ground Floor	Indifferent	„	3	Yard and field.
40	„	2 October	Corsa, 38	„	„	—	„	1st Floor	Clean	„	2	Both
60	M.	10 August	„ 45	„	„	Yard, bad	Yes	„	Not clean	Crowded	1	Yard
75	F.	2 October	Marsalforn, 68	„	„	Good	No	Ground Floor	Indifferent	Not crowded	2 vents	Street
60	M.	25 September	Cortell, 21	„	„	„	„	„	Not clean	„	3	Yard and garden.
90	F.	20 October	„ 31	„	„	„	„	1st Floor	Indifferent	„	1	Garden
66	„	3 „	„ 49	„	„	Yard, bad	Occasionally, yes.	„	Clean	„	1	Open passage
1 7/12	M.	6 „	„ 50	„	„	Yard, indifferent.	„	„	Indifferent	Crowded	3	Field
30	F.	21 September	St. Antonio, 10	„	„	„	No	Ground Floor	Clean	Not crowded	4 vents	Yard
35	M.	7 October	„ 22	„	„	„	Occasionally, yes.	1st Floor	„	„	1	Field
30	F.	7 „	„ „	„	„	„	„	„	„	„	1	„
			CASAL NADUR.									
35	F.	15 August	S. Giovanni, 13	Undrained	Unpaved	Good	—	1st Floor	Indifferent	Not crowded	2, 2 vents.	Garden and terrace, yard.
48	„	19 „	„ 22	„	„	„	No	Ground Floor	Clean	„	None	Yard
54	M.	26 „	Bingemma, 1	„	„	Yard, indifferent.	Occasionally, yes.	„	„	„	1, 2 vents.	Field and yard
90	„	30 „	„ 17	„	„	Yard, bad	„	1st Floor	Indifferent	„	2, 2 vents.	Street and terrace, yard.
62	„	31 „	Parroco, 17	„	„	Good	No	Ground Floor	Clean	„	1	Street
56	F.	20 September	Chiesa, A. 3, 12	„	„	„	Yes	1st Floor	Indifferent	Crowded	1	„
			CASAL SANNAT.									
18	F.	11 August	Cenc, 3	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	1	Yard, open passage.
4	„	16 September	„ 4	„	„	„	„	„	„	Crowded	3 vents	Both
60	„	19 August	„ 5	„	„	„	„	„	„	Not crowded	2	Yard
8	„	9 „	„ 11	„	„	Yard, indifferent.	„	„	„	„	2	Field
„	„	9 „	„ „	„	„	„	„	„	„	„	2	„
12	„	„	„ „	„	„	„	„	„	„	„	2	„

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply.					House Drainage.						Remarks.
	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand. "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No.".	
Outer air	Spring	Good	Sufficient	Carried	None	No	No	No	Dung room	—	No	
"	"	"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	Garden	"	"	"	None	—	—	
"	"	"	"	Well	"	"	"	"	Dung room	—	No	
"	Rain	"	"	Tank	Yard	Yes	"	"	Cesspool	Not supplied	Yes	
"	"	"	"	"	"	"	"	"	"	"	"	
"	"	"	"	"	"	No	"	"	Dung cellar	—	Occasionally, yes	
"	Spring	"	"	Carried	None	"	"	"	Dung room	—	No	
"	"	"	"	"	"	"	"	"	None	—	—	
"	Rain	"	"	"	"	"	"	"	"	—	—	
"	Spring	"	"	"	"	"	"	"	"	—	—	
"	"	"	"	"	"	"	"	"	"	—	—	
"	"	"	"	Well	Garden	"	"	"	Dung room	—	No	
"	"	"	"	"	"	"	"	"	None	—	—	
"	"	"	"	Carried	None	"	"	"	Dung room	—	No	
"	"	"	"	"	"	"	"	"	"	—	Occasionally, yes.	
"	"	"	"	"	"	"	"	"	"	—	No	
"	"	"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	"	"	—	Yes	
"	"	"	"	"	"	"	"	"	None	—	—	
"	"	"	"	"	"	"	"	"	Dung room	—	No	
"	"	"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	"	"	—	Occasionally, yes.	
"	"	"	"	"	"	"	"	"	"	—	No	
"	"	"	"	"	"	"	"	"	Yard	—	"	
"	"	"	"	"	"	"	"	"	Dung room	—	Occasionally, yes.	
"	"	"	"	"	"	"	"	"	"	—	"	
Outer air	Spring	Good	Sufficient	Carried	None	No	No	No	Dung room	—	No	
"	"	"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	"	None	—	—	
"	"	"	"	"	"	"	"	"	Dung room	—	—	
"	Rain	"	"	Tank	—	"	"	"	Garden	—	No	
"	Spring	"	"	Well	Yard	"	"	"	Dung room	—	"	
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	No	
"	"	"	"	Carried	None	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	"	Dung cellar	—	"	
"	"	"	"	Tank	Under house	Yes	"	"	Cesspool	Not supplied.	Yes	
"	"	"	"	"	"	"	"	"	"	"	"	
"		"	"	"	"	"	"	"	"	"	"	

TABLE XX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Gozo,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained," or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
Yrs.		1865.										
15	F.	18 August	Cenc, 11	Undrained	Unpaved	Yard, indifferent.	No.	1st Floor.	Clean	Not crowded	2	Field
66	M.	23 „	„ „	„	„	„	„	„	„	„	2	„
33	F.	24 „	„ 37	„	„	Good	„	„	„	„	2	Field, open passage.
20	„	13 „	„ ?	„	„	„	„	Ground Floor	„	„	1 vent. 2 vents	Yard
44	M.	16 „	Munxar, 1	„	„	Yard, bad	Yes	1st Floor	Indifferent	„	„	Yard, garden
35	F.	31 „	„ 9	„	„	Yard, indifferent.	?	„	„	Crowded	1, 2 vents	Street, yard
3	„	3 September	„ „	„	„	„	?	„	„	„	„	„
15	M.	26 August	„ 20	„	„	Yard, bad	Yes	„	Clean	Not crowded	„	Yard
44	F.	11 September	„ 26	„	„	„	„	„	Indifferent	Crowded	„	Street
13	„	17 „	„ „	„	„	„	„	„	„	„	„	„
25	„	21 August	„ 66	„	„	Yard, indifferent.	„	„	Not clean	Not crowded	2	Street and field
3	M.	26 „	„ „	„	„	„	„	„	„	„	2	„
55	F.	16 September	„ 71	„	„	Good	No	„	Clean	„	1	Street
75	M.	12 August	Zabbetta, 6	„	„	Yard, bad	Yes	„	Indifferent	„	1, 2 vents	Garden, yard
15	F.	22 September	„ 9	„	„	Good	No	„	Clean	„	2, 2 vents	Field, yard
60	M.	27 August	Saguna, 19	„	„	Yard, bad	Yes	„	Indifferent	„	1	Street
66	F.	29 „	„ „	„	„	„	„	„	„	„	1	„
33	„	30 „	„ 21	„	„	„	„	„	„	Crowded	3	Garden
80	„	23 September	Chiesa, 11	„	„	„	„	„	„	„	2	Field
MARSALFORN.												
55	M.	18 August		Undrained	Unpaved	Good	No	Ground Floor	Clean	Crowded	1	Street
27	F.	11 „		„	„	„	„	„	„	Not crowded	1	Bay
CASAL GARBO.												
78	M.	8 August	Torre, 1	Undrained	Unpaved	Yard, bad	?	1st Floor	Clean	Not crowded	2	Field
52	F.	3 October	„ 15	„	„	Good	No	„	„	„	1	Street
52	„	30 September	„ 21	„	„	„	„	„	„	„	1	„
82	M.	2 October	S. Lorenzo, 2	„	„	Yard, indifferent.	„	„	Indifferent	„	1 vent	Yard
70	M.	18 September	S. Lorenzo, 16	„	„	Good	„	„	Clean	„	1	Field
50	F.	19 „	„ „	„	„	„	„	„	„	„	1	„
50	„	24 „	„ 25	„	„	„	„	Ground Floor	Indifferent	„	None	—
50	M.	2 „	„ 30	„	„	Yard, bad	?	1st Floor	Clean	Crowded	1	Field
80	„	27 „	„ 43	„	„	Good	No	„	Indifferent	Not crowded	2	„
3	F.	26 „	„ 54	„	„	Yard, bad	Yes	„	„	„	1	Street
14	M.	29 „	„ „	„	„	„	„	„	„	„	1	„
50	„	2 „	Wileg, 6	„	„	Good	No	„	Clean	„	1	„
65	F.	12 „	„ 27	„	„	„	„	„	„	„	1	„
23	M.	16 „	Fungus Rock, 4	„	„	Yard, indifferent.	„	„	„	„	2	„
11	F.	6 „	„ 5	„	„	„	„	„	„	„	1 vent	Yard
40	M.	19 „	„ „	„	„	Good	„	„	„	„	1	„
4	F.	7 „	Sdieri, 8	„	„	„	„	„	Indifferent	Crowded	2	Both
3	„	13 „	Trux, 17	„	„	„	„	„	Clean	Not crowded	1	„
1	M.	14 „	„ „	„	„	„	„	„	„	„	1	„
27	F.	14 „	„ „	„	„	„	„	„	„	„	1	„
28	M.	15 October	Wied Meril, 12	„	„	„	„	„	Indifferent	„	1	Street
[illegible]	F.	7 „	„ 13	„	„	„	Yes	„	Clean	„	2	„
		19 September	Blata, 35	„	„	„	„	„	Indifferent	„	1	„

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply. Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	House Drainage. Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Rain	Good	Sufficient	Tank	Under house	Yes	No	No	Cesspool	Not supplied.	Yes	—
"	"	"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	Carried	Yard, empty	No	"	"	None	—	—	—
"	"	"	"	"	None	"	"	"	Corner of yard.	—	Yes	—
"	"	"	"	Tank	Garden	"	"	"	Dung room	—	"	—
"	"	"	"	Carried	Garden, empty.	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	"	—	"	—
"	"	"	"	Carried	Garden, empty.	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	None	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	Spring	"	"	"	"	"	"	"	"	—	No	—
"	Rain	"	"	Tank	Yard	"	"	"	"	—	Yes	—
"	Spring	"	"	Carried	None	"	"	"	None	—	—	—
"	Rain	"	"	Tank	Garden	"	"	"	Dung room	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	Spring	"	"	Carried	Yard, empty	"	"	"	"	—	"	—
"	Rain	"	"	"	Yard, water not used.	"	"	"	"	—	"	—
Outer air	Rain	Good	Sufficient	Carried	None	No	No	No	None	—	—	—
"	"	"	"	Tank	House	Yes	"	"	Sink	By hand	No	Died at 42, Strada Carità, Rabat.
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	No	—
"	"	"	"	"	Garden	"	"	"	"	—	Yes	—
"	"	"	"	"	Yard	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	"	—	Occasionally, yes.	—
"	"	"	"	"	"	"	"	"	Dung cellar	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	None	"	"	"	None	—	—	—
"	"	"	"	"	Garden	"	"	"	Dung room	—	No	—
"	"	"	"	"	None	"	"	"	"	—	Occasionally, yes.	—
"	"	"	"	Tank	Garden	"	"	"	"	—	—	—
"	"	"	"	"	"	"	"	"	"	—	—	—
"	"	"	"	Carried	Yard	"	"	"	"	—	No	—
"	"	"	"	Tank	"	"	"	"	"	—	"	—
"	"	"	"	Carried	Yard, empty	"	"	"	"	—	"	—
"	"	"	"	"	Entrance, empty.	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	"	—	"	—
"	"	"	"	Carried	Garden, water not used.	"	"	"	Dung room, garden.	—	"	—
"	"	"	"	Tank	Yard	"	"	"	Dung cellar	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	Dung room	—	"	—
"	"	"	"	Carried	None	"	"	"	"	—	Yes	—
"	"	"	"	Tank	Yard	"	"	"	"	—	No	—

TABLE XX.—Statistical Return showing the Sanitary Condition of Dwellings, in Villages of Gozo,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attacked.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or "Not clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
BIRBULA (a hamlet near C. Garbo).												
Yrs.		1865.										
25	M.	9 October	7	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	1	Street
52	F.	16 „	„	„	„	„	„	„	„	„	1	„
80	M.	16 „	9	„	„	„	„	„	Very clean	„	2	Garden and field.
65	„	16 „	13	„	„	„	„	„	Clean	„	1	Garden
80	„	19 „	22	„	„	„	„	„	Very clean	„	1	Field
57	F.	20 September	35	„	„	„	„	„	Clean	„	1	„
MUNXAR (a hamlet near C. Sannat).												
66	M.	26 September	12	Undrained	Unpaved	Good	No	1st Floor	Not clean	Not crowded	1	Yard
1½	F.	12 August	24	„	„	„	„	„	Clean	„	1	Street
45	[illegible]	[illegible]	28	„	„	„	„	Ground Floor	„	„	3 vents	Both
[illegible]	[illegible]	[illegible]	„	„	„	„	„	„	„	„	„	„
[illegible]	[illegible]	[illegible]mber	30	„	„	„	„	1st Floor	„	„	1	Street
[illegible]	[illegible]	[illegible]	38	„	„	„	Yes	„	Indifferent	„	1	Garden
[illegible] (a hamlet near C. Garbo.)												
[illegible]	[illegible]	[illegible]	26	„	„	„	No	1st Floor	Indifferent	Not crowded	1	Terrace
[illegible]	[illegible]	[illegible]r	44	„	„	„	„	„	Not clean	„	1	Field
[illegible]EM (a hamlet near Rabato).												
88	M.	2 September	Peipu, 3	Undrained	Unpaved	Good	Yes	1st Floor	Clean	Not crowded	2	Yard and terrace.
36	F.	2 „	Santa Maria, 4	„	„	„	No	„	Not clean	Crowded	1	Yard
11	„	8 „	„ 14	„	„	„	„	„	Clean	Not crowded	1	Garden
75	M.	10 „	S. Gregorio, 16	„	„	„	Yes	Basement	Not clean	Crowded	None	—
55	„	7 „	„ 17	„	„	„	—	—	—	—	—	—
50	F.	20 August	„ 21	„	„	„	No	1st Floor	Clean	Crowded	1	Street
36	„	20 September	„ 26	„	„	„	„	„	„	Not crowded	1	„
6	M.	9 August	Ghain Tuta, 3	„	„	„	„	„	?	?	?	?
70	F.	24 „	„ 8	„	„	„	Yes	„	Not clean	Crowded	2	Street and garden.
20	„	2 September	„ 14	„	„	„	No	Ground Floor	Clean	Not crowded	2 vents	Yard
65	M.	14 August	„ ?	„	„	„	„	1st Floor	„	„	4 vents	Both
40	F.	29 „	Annunziata, 21	„	„	„	„	„	Indifferent	„	None	—
SANTA LUCIA (a hamlet near Kercem).												
35	F.	9 Sept.	Santa Lucia, 34	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	4 vents	Yard and garden.
18	M.	16 August	Saro, 22	„	„	„	„	—	—	—	—	—
CASAL ZEBBUG.												
56	F.	27 August	Chiesa, 2	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	2	Street
55	„	6 October	Ghain Melel, 19	„	„	„	„	„	Not clean	Crowded	1	Field
26	M.	10 „	„ „	„	„	„	„	„	„	„	1	„
5	F.	18 September	Punta, 1	„	„	„	„	Ground Floor	Clean	„	3 vents	Both
30	„	23 „	„ „	„	„	„	„	„	„	„	„	„
48	M.	27 „	„ „	„	„	„	„	„	„	„	„	„
62	F.	2 October	„ 2	„	„	„	Yes	1st Floor	„	Not crowded	1, 2 vents	Street, yard
53	F.	4 September	„ 30	„	„	„	No	„	Indifferent	Not crowded	1	Garden
55	M.	18 „	Sellum, 1	„	„	„	„	Ground Floor	„	„	1	Field
40	F.	29 „	Canun, 1	„	„	„	„	„	Clean	„	3	Yard
28	„	3 October	„ „	„	„	„	„	1st Floor	„	„	1	Garden
[illegible]	M.	8 „	„ „	„	„	„	„	„	„	„	1	„
[illegible]	[illegible]	27 September	Scapuccina, 12	„	„	„	No	1st Floor, open passage	„	„	—	—

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

	Water Supply.					House Drainage.						
Doors: whether opening into a "Common Stair," or into the "Outer Air."	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack: "Yes," or "No."	Remarks.
Outer air	Rain	Good	Sufficient	Carried	Yard, water tasted badly.	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	Yard	"	"	"	"	—	"	—
"	"	"	"	"	Garden and yard	"	"	"	"	—	"	—
"	"	"	"	"	Field	"	"	"	"	—	"	—
"	"	"	"	"	Yard	"	"	"	"	—	"	—
Outer air	Rain	Good	Sufficient	Carried	None	No	No	No	Dung room	—	No	—
"	"	"	"	Tank	Yard	"	"	"	"	—	Yes	—
"	"	"	"	Carried	None	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	Spring	"	"	"	"	"	"	"	"	—	"	—
"	Rain	"	"	Tank	Yard	"	"	"	"	—	Yes	—
Outer air	Rain	Good	Sufficient	Carried	None	No	No	No	Dung room	—	Yes	—
"	"	"	"	Tank	Yard	"	"	"	"	—	No	—
Outer air	Rain	Good	Sufficient	Tank	Entrance	No	No	No	Dung room	—	Yes	—
"	Spring	"	"	Carried	None	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	Dung cellar	—	No	—
"	"	"	"	"	Garden, water tasted badly.	"	"	"	Dung room	—	Yes	—
—	—	—	—	—	—	—	—	—	—	—	—	Not visited.
Outer air	Spring	Good	Sufficient	Carried	None	No	No	No	Dung cellar	—	No	—
"	"	"	"	"	Yard, empty	"	"	"	Dung room	—	"	—
"	"	"	"	"	None	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	Yes	—
"	"	"	"	"	Yard, water tasted badly.	"	"	"	"	—	"	—
"	Rain	"	"	"	None	"	"	"	"	—	No	—
"	Spring	"	"	"	"	"	"	"	Dung cellar	—	"	—
Outer air	Spring	Good	Sufficient	Carried	None	No	No	No	Dung cellar	—	No	—
"	"	"	"	"	"	"	"	"	Dung room	—	"	Slept on the terrace.
Outer air	Spring	Good	Sufficient	Well	Garden	Yes	No	No	Cesspool	—	Occasionally, yes.	—
"	"	"	"	Carried	"	No	"	"	Dung room	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Well	"	"	"	"	"	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	Yard	"	"	"	"	—	Yes	—
"	"	"	"	Carried	Yard, empty	"	"	"	"	—	No	—
"	"	"	"	"	None	"	"	"	None	—	—	—
"	"	"	"	Well	Garden	"	"	"	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Carried	None	"	"	"	"	—	"	—

TABLE XX.—Statistical Return showing the Sanitary Condition of Dwellings in Villages of Gozo,

Fatal Cases of Cholera.			Name of Street, Court, Place, &c., and Number or Designation of House where attached.	State whether the Street or Court was "Drained" or "Undrained."	State whether the Surface was "Properly paved," or "Indifferent," or "Bad."	State general Sanitary Condition of Street or Court: "Good," "Indifferent," or "Bad."	State whether any Nuisances were complained of at or before the Time of Attack.	State in which Floor of the House the Patient was attacked: "Basement," "Ground Floor," "Mezzanine," "1st Floor," "2nd Floor," &c.	State whether the Walls, Ceilings, or Floors of the House were "Clean," "Indifferent," or Not Clean."	State whether, at the Date of Attack, the Inmates of the Rooms were "Crowded," "Not crowded," &c.	Windows.	
Age.	Sex.	Date of Death.									State No. in affected Room.	State whether the Windows open into a "Street," "Court," or "both."
CHAJAR (a few houses between C. Zebbug and Marsalforn Bay).												
Yrs. 3	M.	1865. 21 August	- - - - -	Undrained	Unpaved	Good	Yes	1st Floor	Indifferent	Not crowded	2	Field
40	F.	23 „	- - - - -	„	„	„	„	„	„	„	2	
37	M.	23 „	- - - - -	„	„	„	„	„	„	„	2	„
23	F.	28 „	- - - - -	„	„	„	No	„	Clean	„	2	Yard and terrace.
GHASRI (a hamlet between C. Zebbug, Mt. Giordan, and Mt Ghammar).												
27	F.	23 September	Faro, 18 - - -	Undrained	Unpaved	Good	No	1st Floor	Clean	Not crowded	1	Garden
25	„	9 „	„ 32 - - -	„	„	„	„	„	„	„	1	Field
GHAMMAR (a hamlet near C. Garbo).												
40	F.	29 September	Ghammar, 20 - -	Undrained	Unpaved	Good	Yes	1st Floor	Clean	Not crowded	1, 2 vents	Street, yard
70	M.	3 October	„ 27 - -	„	„	„	No	„	„	„	1	Garden
14	F.	5 „	„ „ - -	„	„	„	„	„	Indifferent	„	1	Terrace
40	M.	1 „	„ 41 - -	„	„	„	„	„	„	Crowded	1, 2 vents	Street, yard

TABLE XXI.—SHOWING the SANITARY CONDITION of AFFECTED QUARTERS, together with CASES and

Occupation when the Epidemic appeared:		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
Barracks.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
Plague Hospital -	Royal Artillery	Henry Forrester -	29	—	—	28 June -	Recovered	Ground Floor	2	Married quarters.
Tents at Salvatore Counterguard.	„	James Whitfield -	36	—	—	7 July -	Recovered from cholera, and died of pneumonia.	„	Tent	Married
Fort Tigne - -	„	William Funnell -	30	—	—	9 „ -	10 July -	1st Floor	17	421
St. Elmo - -	„	William Crouk -	29	—	—	16 „ -	17 „ -	„	14	535
„ - -	„	Edward Dabbs -	25	—	—	17 „ -	Recovered	Ground Floor	5	493
St. James Cavalier -	„	George Garment -	29	—	—	20 „ -	22 July -	„	3	882
Private Lodgings, Floriana.	„	Edward Stokes -	39	—	—	21 „ -	22 „ -	—	—	—
St. James Cavalier -	„	William Bourdell -	27	—	—	25 „ -	Recovered	Ground Floor	6	585
Marsamuscetto -	„	Charles Granger -	29	—	—	26 „ -	30 July -	„	2	800
St. James Cavalier -	„	William Morgan -	33	—	—	30 „ -	30 „ -	„	1	585
St. Salvatore -	„	Henry Bowley -	29	—	—	1 August -	1 August -	„	3 Married quarters	
St. Elmo - -	„	George Hopwood -	29	—	—	7 „ -	7 „ -	„	Band Hut.	1,000
St. Salvatore -	„	Samuel Segars -	27	—	—	13 „ -	14 „ -	„	1 A.	600
St. Elmo - -	„	Edward Pugh -	29	—	—	26 „ -	Recovered	„	9	493
Fort Tigne - -	„	William Wilson -	25	—	—	1 Sept. -	2 Sept. -	„	6	527
Marsamuscetto -	„	George Bourne -	25	—	—	20 „ -	21 „ -	„	2	800
„ -	„	John Boddell -	38	—	—	18 Oct. -	Recovered	1st Floor	1	800
St. Elmo - -	„	James Mather -	31	—	—	21 „ -	„	Ground Floor	3 Hut	1,000
St. Angelo - -	„	William Savage -	26	—	—	12 Nov. -	„	„	14	542
„ - -	„	Thomas Silley -	30	26 June -	Recovered	—	—	„	7	545
St. James Cavalier -	„	Frances Monk -	25	4 July -	„	—	—	1st Floor	5	882

where Cases of Cholera occurred, during the Epidemic of 1865 (prepared by Dr. Ghio)—*continued.*

Doors: whether opening into a "Common Stair," or into the "Outer Air."	Water Supply.					House Drainage.						Remarks.
	Whence derived.	Quality at the Time of Attack: "Good," "Clear," "Muddy," "Tasted badly," &c.	Quantity: "Sufficient," or "Insufficient."	How obtained: "Drawn from Tank," or "From Well," "Carried," "Drawn from Pipe," &c.	Situation of Water Tank: "Under Room," or "House," "Under Court," &c.	Whether any House Drains: "Yes," or "No."	Whether any open Gulley or Sink in the Street or Court close to the House attacked: "Yes," or "No."	Any Smell from such Gulley or Sink at the Time the Patient was attacked, or whether any Drain opened within the Room or House affected.	Nature of Privy Accommodation: "Open Sink," or "Common Privy," &c. &c.	How Privy is supplied with Water: "By Pipe," "By Hand," "Not supplied."	Whether Nuisance or Smell arose from Privy at Time of Attack; "Yes," or "No."	
Outer air	Rain	Good	Sufficient	Carried	Yard, water not used.	No	No	No	Dung room	—	Yes	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	Tank	House	"	"	"	"	—	No	—
Outer air	Rain	Good	Sufficient	Carried	Yard, water tasted badly.	No	No	No	Dung room	—	No	—
"	"	"	"	"	"	"	"	"	"	—	"	—
Outer air	Rain	Good	Sufficient	Tank	Yard	No	No	No	Dung room	—	Yes	—
"	"	"	"	"	Garden and yard, water tasted badly.	"	"	"	"	—	"	—
"	"	"	"	Carried	None	"	"	"	"	—	No	—
"	"	"	"	Tank	Yard	"	"	"	"	—	Yes	—

(Signed) ANTHONY GHIO, M.D.,
Chief Police Physician, and Physician to the Lazaretto.

DEATHS from DIARRHŒA and CHOLERA among TROOPS at MALTA, during the EPIDEMIC of 1865.

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Limewashed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
	From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Sufficient	Drains	Latrines	Filthy sea shore.	No	Rain water tank.	Sufficient	Good	—	Bad	Near the ill-drained Lazaretto.
"	No	No	No	"	Aqueduct	"	"	2 months	Good	Tents occupied by married soldiers and their families removed from Plague Hospital.
"	"	"	"	"	Tanks	"	Muddy	"	"	
"	"	"	"	"	"	"	Good	"	"	Bad streets near.
"	"	"	"	"	"	"	"	"	"	" "
Insufficient	Drains	Latrines	Yes	Filthy ditch	"	"	Tasted badly	"	Indifferent	—
"	No	No	No	No	"	—	—	—	"	At Floriana.
"	Drains	Latrines	Yes	Ditch	"	Sufficient	Tasted badly	2 months	"	—
"	No	No	No	No	Aqueduct	"	Good	"	"	Near Manderaggio.
"	Drains	Latrines	Yes	Ditch	Tank	"	Tasted badly	"	"	—
Sufficient	No	No	No	No	"	"	Good	"	Good	—
"	"	"	"	"	"	"	"	"	Indifferent	—
"	"	"	"	"	"	"	"	"	Good	—
"	"	"	"	"	"	"	"	3 months	"	—
"	"	"	"	"	"	"	Muddy	4 "	"	—
Insufficient	"	"	"	"	Aqueduct	"	Good	"	Indifferent	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	Tanks	"	"	"	"	—
"	"	"	"	"	"	"	Tasted badly	5 months	Good	—
Sufficient	"	"	"	"	Rain water in tanks.	"	"	1 month	"	—
Insufficient	Drains	Latrines	Yes	Ditch	Tanks	"	"	2 months	Indifferent	Lime was thrown over the sewage in the ditch, but without any [illegible] effect.

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
Barracks.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
St. James Cavalier -	Royal Artillery	William Rees - -	24	10 July	Recovered	—	—	1st Floor	6	585
Upper St. Elmo -	„	Harry Nicholson -	29	15 „	„	—	—	Ground Floor	7	480
St. Elmo - - -	„	Benjamin Court -	27	8 „	„	—	—	1st Floor	17	535
Hired House -	„	Andrew Lasau -	28	14 „	„	—	—	—	—	—
St. Elmo - - -	„	John Edwards -	24	16 „	„	—	—	1st Floor	14	585
Fort Salvatore -	„	William Mitchell -	30	15 „	„	—	—	Ground Floor	1	584
St. Elmo - -	„	Joseph Walden -	33	20 „	„	—	—	1st Floor	11	585
„ - -	„	Robert Smith -	28	15 „	„	—	—	„	15	531
Ricasoli - -	„	Richard Manning -	36	20 „	„	—	—	Ground Floor	2	612
St. Elmo - -	„	Andrew Mouger -	28	20 „	„	—	—	„	37	553
„ - -	„	Stephen Reid - -	31	25 „	„	—	—	„	5	493
„ - -	„	James Leach - -	27	25 „	„	—	—	„	Band Hut.	1,000
St. James Cavalier -	„	George Rodber -	32	26 „	„	—	—	„	3	882
St. Elmo - - -	„	James Coss - -	24	25 „	„	—	—	„	7	480
„ - -	„	David Edwards -	31	27 „	„	—	—	1st Floor	14	585
St. Angelo - -	„	William Fay. - -	31	28 „	„	—	—	„	16	587
Marsamuscetto -	„	Joshua Taylor -	32	29 „	„	—	—	Ground Floor	1	800
„ - -	„	Richard Jones -	30	30 „	„	—	—	„	1	800
St. Elmo - - -	„	Michael Keane -	23	30 „	„	—	—	„	3 Hut	1,000
„ - -	„	William Brooks -	28	31 „	„	—	—	1st Floor	11	534
„ - -	„	William Peters -	23	31 „	„	—	—	Ground Floor	Band Hut.	1,000
„ - -	„	Harry Nicholson -	29	31 „	„	—	—	„	7	480
„ - -	„	Joseph McKendry -	33	1 August	„	—	—	„	9	493
„ - -	„	Benjamin Court -	27	1 „	„	—	—	1st Floor	17	535
„ - -	„	James Coss - -	24	1 „	„	—	—	Ground Floor	7	480
Marsamuscetto -	„	Joshua Taylor -	32	9 „	„	—	—	„	1	800
St. Elmo - -	„	John Debnam -	34	9 „	„	—	—	1st Floor	17	535
St. Salvatore -	„	Thomas Thomas -	25	9 „	„	—	—	Ground Floor	13	569
St. Elmo - -	„	George Campbell -	27	9 „	„	—	—	1st Floor	12	540
„ - -	„	Samuel McCormick -	30	9 „	„	—	—	„	12	540
Marsamuscetto -	„	John Phipps - -	31	9 „	„	—	—	Ground Floor	1	800
St. Elmo - -	„	William Finn - -	27	10 „	„	—	—	1st Floor	12	540
St. Salvatore -	„	James White - -	28	10 „	„	—	—	„	2 married quarters.	—
St. Elmo - -	„	John Burgess - -	32	12 „	„	—	—	„	16	535
„ - -	„	Alfred Harris - -	22	12 „	„	—	—	Ground Floor	7	480
„ - -	„	John Risely - -	33	12 „	„	—	—	„	36	532
St. Salvatore -	„	John Watkins - -	25	12 „	„	—	—	„	10	584
Marsamuscetto -	„	Andrew Rice - -	29	12 „	„	—	—	„	1	800
St. Salvatore -	„	John Bell - -	28	12 „	„	—	—	„	3 married quarters.	—
Hired Quarters -	„	John Macklin - -	40	17 „	„	—	—	—	—	—
St. Salvatore -	„	James Dougherty -	31	16 „	„	—	—	1st Floor	4	682
Ricasoli - -	„	Josiah Owen - -	32	19 „	„	—	—	Ground Floor	2	612
St. James Cavalier -	„	James Weakley -	23	22 „	„	—	—	1st Floor	6	585
St. Elmo - -	„	Alfred Woodruffe -	33	23 „	„	—	—	Ground Floor	3	491
St. Salvatore -	„	Thomas Pearson -	28	23 „	„	—	—	„	1 A.	600
St. JamesCavalier -	„	Edward Ives - -	32	24 „	„	—	—	1st Floor	4	882
St. Elmo - -	„	Harry Nicholson -	29	25 „	„	—	—	Ground Floor	7	480
Marsamuscetto -	„	George Bourne -	26	25 „	„	—	—	„	2	800
St. James Cavalier -	„	John Caple - -	27	26 „	„	—	—	1st Floor	3	882
St. Elmo - -	„	William Campbell -	30	26 „	„	—	—	Ground Floor	7	480
„ - -	„	Benjamin Court -	27	28 „	„	—	—	1st Floor	17	535
James Cavalier -	„	William Tasker -	27	29 „	„	—	—	„	4	882
lo -	„	John Metcalf - -	31	29 „	„	—	—	Ground Floor	5	516

from Diarrhœa and Cholera among Troops at Malta during the Epidemic of 1865—*continued.*

	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.					
State of Ventilation: "Sufficient," "Insufficient."	From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."	How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	REMARKS.
Insufficient	Drains	Latrines	Yes	Ditch	Tanks	Sufficient	Tasted badly	2 months	Indifferent	—
Sufficient	No	No	No	No	,,	,,	Good	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
—	—	—	—	—	—	—	—	—	—	Came to hospital from his lodgings at Shima.
Sufficient	No	No	No	No	Tanks	Sufficient	Good	2 months	Indifferent	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Good	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Indifferent	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Insufficient	Drains	Latrines	Yes	Ditch	,,	,,	Tasted badly	,,	,,	—
Sufficient	No	No	No	No	,,	,,	Good	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	Tasted badly	,,	Good	—
Insufficient	,,	,,	,,	,,	Aqueduct	,,	Good	,,	Indifferent	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Sufficient	,,	,,	,,	,,	Tanks	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Insufficient	,,	,,	,,	,,	Aqueduct	,,	,,	,,	,,	—
Sufficient	,,	,,	,,	,,	Rain water in tanks.	,,	,,	3 months	Indifferent	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Good	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Indifferent	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Insufficient	,,	,,	,,	,,	Aqueduct	,,	,,	,,	,,	—
Sufficient	,,	,,	,,	,,	Tanks	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Good	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Indifferent	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Good	—
Insufficient	,,	,,	,,	,,	Aqueduct	,,	,,	,,	Indifferent	—
Sufficient	,,	,,	,,	,,	Tank	,,	,,	,,	Good	—
Insufficient	,,	,,	,,	Old masonry	—	—	—	—	Bad	In a back street near the hospital.
Sufficient	,,	,,	,,	No	Tank	Sufficient	Good	3 months	Good	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Indifferent	Never a very healthy barrack.
Insufficient	Drains	Latrines	Yes	Ditch	Store department tank.	,,	,,	,,	,,	—
Sufficient	No	No	No	No	Tank	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	Good	—
Insufficient	Drains	Latrines	Yes	Ditch	Store department tank.	,,	,,	,,	Indifferent	—
Sufficient	No	No	No	No	Tank	,,	,,	,,	,,	—
Insufficient	,,	,,	,,	,,	Aqueduct	,,	,,	,,	,,	—
,,	Drains	Latrines	Yes	Ditch	Store department tank.	,,	,,	,,	,,	—
Sufficient	No	No	No	No	Tank	,,	,,	,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	—
Insufficient	Drains	Latrines	Yes	Ditch	Store department tank.	,,	,,	,,	,,	—
Sufficient	No	No	No	No	Tank	,,	Tasted badly	,,	Good	—

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
Barracks.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
St. Angelo	Royal Artillery	David Knight	Yrs. 28	29 August	Recovered	—	—	Ground Floor	5	516
Ricasoli	„	Robt. Dougherty	33	31 „	„	—	—	„	1	608
St. Salvatore	„	William Best	28	2 September	„	—	—	„	2 married quarters.	—
St. Angelo	„	John Debnam	34	6 „	„	—	—	„	17	537
Ricasoli	„	William Reid	28	7 „	„	—	—	„	2	612
„	„	Henry H. Price	23	13 „	„	—	—	„	2	612
„	„	Barthw. Byrne	30	14 „	„	—	—	„	1	608
Tigne	„	Robt. Johnson	30	22 „	„	—	—	„	13	440
„	„	James Towan	28	22 „	„	—	—	„	12	440
„	„	James Johnson	35	24 „	„	—	—	„	12	440
„	„	Henry Manning	34	24 „	„	—	—	„	14	440
„	„	William Goodwin	30	25 „	„	—	—	„	15	598
St. Salvatore	„	Thomas Tinkington	38	25 „	„	—	—	„	1	584
„	„	Thomas Pearson	28	28 „	„	—	—	„	1 A.	600
St. Elmo	„	William Rees	25	4 October	„	—	—	„		585
St. Angelo	„	Henry Legg	27	4 „	„	—	—	„	7	545
St. Elmo	„	Benjamin Court	27	11 „	„	—	—	1st Floor	17	535
Marsamuscetto	„	Richard Allert	28	13 „	„	—	—	Ground Floor	1	800
St. Elmo	„	William Roberts	25	26 „	„	—	—	„	15	534
St. Salvatore	„	David Knight	28	26 „	„	—	—	1st Floor	5	682
Ricasoli	„	Alfred Woodruffe	34	6 November	„	—	—	Ground Floor	1	608
„	„	George Glendenning	26	7 „	„	—	—	„	2	612
Marsamuscetto	„	William Bourdell	26	11 „	„	—	—	„	2	800
Lower St. Elmo	100th Regiment	Private E. Dent	33	—	—	18 July	19 July	1st Floor	3	788
„	„	Lance-Corporal Price	18	19 July	R. 16 Sept.	—	—	2nd Floor	4	777
Auberge de Baviere	„	Private J. Chapman	24	19 „	R. 26 July	—	—	1st Floor	Kitchen 30	1,809
Lower St. Elmo	„	Serjeant F. Gross	29	20 „	R. 8 August	—	—	„	10	796
Garrison Hospital	„	*Private T. J. Fowler	35	20 „	Readmitted	—	—	Ground Floor	20 C.	3,807
Lower St. Elmo	„	Lance-Corporal R. Brown.	25	21	R. 24 July	—	—	1st Floor	5	750
„	„	Private M. W. Doyle	34	—	—	22 July	23 July	„	6	760
„	„	„ R. Rounds	23	—	—	22 „	23 „	2nd Floor	7	859
„	„	„ W. Beechey	23	—	—	23 „	23 „	1st Floor	5	750
„	„	„ J. Greenam	33	22 July	R. 30 July	—	—	„	6	760
„	„	„ W. Smith	27	22 „	R. 29 „	—	—	2nd Floor	10	747
„	„	„ P. Buchanan	34	22 „	R. 31 August	—	—	„	12	838
„	„	„ J. Gullivan	25	22 „	R. 28 July	—	—	„	5	691
„	„	„ F. Gorman	26	—	—	23 July	24 July	„	4	758
„	„	„ E. Sturt	28	—	—	23 „	23 „	1st Floor	7	859
Garrison Hospital	„	„ J. J. Fowler	35	—	—	23 „	24 „	Ground Floor	20 C.	3,559
Cells, Lower St. Elmo.	„	„ B. Mirach	27	—	—	24 „	24 „	Cells, Lower St. Elmo.	—	574
Lower St. Elmo	„	„ Jno. Smith	32	23 July	R. 26 July	—	—	2nd Floor	7	859
„	„	„ J. Ainslie	34	25 „	R. 4 August	—	—	1st Floor	3	788
„	„	„ W. Burnett	36	—	—	24 July	25 July	„	2	750
„	„	Corporal C. Fowler	29	—	—	25 „	25 „	„	2	750
		Lance-Corporal E. Hennesey.	26	25 July	R. 26 July	—	—	2nd Floor	10	747

from Diarrhœa and Cholera among Troops at Malta during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
	*From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Sufficient	No	No	No	No	Tank	Sufficient	Tasted badly	3 months	Good	—
"	"	"	"	"	Rain water tank.	"	Good	4 months	Indifferent	—
"	"	"	"	"	"	"	"	"	Good	—
"	"	"	"	"	"	"	Tasted badly	"	"	—
"	"	"	"	"	"	"	Good	"	Indifferent	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	Muddy, and tasted badly.	"	Good	Drain from latrine broken into tank.
"	"	"	"	"	"	"	"	"	"	" "
"	"	"	"	"	"	"	"	"	"	" "
"	"	"	"	"	"	"	"	"	"	" "
"	"	"	"	"	"	"	"	"	"	" "
"	"	"	"	"	"	"	Good	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	5 months	Indifferent	—
"	"	"	"	"	"	"	Tasted badly	"	Good	—
"	"	"	"	"	"	"	Good	"	Indifferent	—
Insufficient	"	"	"	"	Aqueduct	"	"	"	"	—
Sufficient	"	"	"	"	Tank	"	"	"	"	—
"	"	"	"	"	"	"	"	"	Good	—
"	"	"	"	"	"	"	"	"	Indifferent	—
"	"	"	"	"	"	"	"	"	"	—
Insufficient	"	"	"	"	Aqueduct	"	"	"	"	—
Insufficient	Yes, frequently from old main drain.	None	From opening of city sewers.	From officers' stables.	Aqueduct	Sufficient	Good and clear.	The barracks were thoroughly scraped and limewashed previous to the regiment marching in on the 24th of March 1865, since which time, the rooms have been continually limewashed, as high as the iron racks, and round the base of the walls on the floor.	Bad	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	No	"	"	"		Indifferent	Miss Warton.
"	"	"	"	From officers' stables.	"	"	"		Bad	—
"	Yes, especially from open drain outside 20 C. ward.	Yes, from latrines outside ward.	Yes, especially from outside 20 C. ward.	No.	"	"	"		"	Hospital Orderly
"	Yes, frequently from old main drain.	None	From opening of city sewers.	From officers' stables.	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	Yes, especially from open drain outside 20 C. ward.	Yes, from latrines outside ward.	Yes, especially from outside 20 C. ward.	No	"	"	"		"	Re-admitted with Cholera. An Hospital Orderly.
"	Yes, frequently from old main drain.	None	From opening of city sewers.	From officers' stables.	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—

THOMAS PARK, Surgeon, 3rd Battery, Royal Artillery.

* Drainage of Lower St. Elmo re-modelled and improved during epidemic whilst barracks were vacant.

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
Barracks.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
Lower St. Elmo	100th Regiment	Private P. Carroll	Yrs. 29	—	—	26 July	R. 18 August	1st Floor	11	716
„	„	„ J. Blotner	31	25 July	R. 4 August	—	—	„	1	818
„	„	„ J. Ryan	25	26 „	R. 11 „	—	—	„	5	750
„	„	„ W. Elliott	33	26 „	R. 4 „	—	—	„	11	716
„	„	„ S. Cunningham.	28	27 „	R. 1 „	—	—	„	4	816
„	„	„ J. Greeson	25	27 „	R. 30 July	—	—	„	1	818
„		„ J. Bidermiller	27	—	—	27 July	28 July	2nd Floor	12	838
Encampment outside Fort Manoel.	„	„ J. Neil	33	27 July	R. 4 August	—	—	Ground Floor	Tent	102
„	„	Lance-Serjeant F. Bishop.	31	27 „	[illegible]	—	—	„	„	102
„	„	Private A. Achison	24	28 „	R. 1 August	—	—	„	„	102
„	„	„ G. Brown	36	28 „	R. 1 „	—	—	„	„	102
Auberge de Baviere	„	Serjeant J. Price	23	28 „	R. 29 July	—	—	„	Kitchen 17	5,100
Encampment outside Fort Manoel.	„	Private T. Lowery	26	28 „	R. 1 August	—	—	„	Tent	102
„	„	„ M. Meehan	32	28 „	R. 1 „	—	—	„	„	102
„	„	Serjeant J. Saunders	36	28 „	R. 2 „	—	—	„	„	102
„	„	Private T. Ferguson	25	—	—	28 July	31 July	„	„	102
„	„	„ J. Cummins	31	28 July	R. 1 August	—	—	„	„	102
„	„	„ W. Hinds	31	28 „	R. 3 „	—	—	„	„	102
„	„	„ A. Swartz	32	28 „	R. 8 „	—	—	„	„	102
„	„	„ T. Sturgers	25	28 „	R. 3 „	—	—	„	„	102
„	„	Serjeant J. S. McPherson.	34	28 „	R. 1 „	—	—	„	„	102
„	„	Private J. Black	35	28 „	R. 5 „	—	—	„	„	102
„	„	„ J. Davenport	34	—	—	30 July	31 July	„	„	102
„	„	„ J. Nevan	28	—	—	30 „	31 „	„	„	102
St. Michael's Guard	„	„ J. Forrester	26	—	—	30 „	31 „	„	Unknown.	
Encampment outside Fort Manoel.	„	Lance-Corporal J. Chisholm.	26	30 July	R. 9 August	—	—	„	Tent	102
„	„	Private J. Barker	32	31 „	R. 4 „	—	—	„	„	102
„	„	„ G. Lawson	21	31 „	R. 5 „	—	—	„	„	102
„	„	„ W. Groom	24	31 „	R. 3 „	—	—	„	„	102
„	„	„ R. Cobourne	33	31 „	R. 3 „	—	—	„	„	102
„	„	Corporal W. Richardson.	24	31 „	R. 3 „	—	—	„	„	102
„	„	Private W. Boyd	32	31 „	R. 4 „	—	—	„	„	102
Crown Work	„	„ S. Conroy	36	1 August	R. 4 „	—	—	„	14	Married
Encampment outside Fort Manoel.	„	„ P. Gorman	29	1 „	R. 4 „	—	—	„	Tent	102
„	„	Private C. York	32	1 „	R. 3 „	—	—	„	„	102
„	„	„ W. Watson	27	2 „	R. 5 „	—	—	„	„	102
„	„	„ J. Conelly	28	3 „	R. 4 „	—	—	„	„	102
„	„	„ E. Wood	25	—	—	3 August	3 August	„	„	102
„	„	„ J. Crampton	28	3 August	R. 5 August	—	—	„	„	102
Crown Works	„	Corporal J. McDonald	26	3 „	R. 9 „	—	—	„	7	Married
Encampment outside Fort Manoel.	„	Private J. Symonds	29	4 „	R. 8 „	—	—	„	Tent	102
„	„	„ J. Thuse	29	5 „	R. 10 „	—	—	„	„	102
„	„	„ M. Whitely	36	5 „	R. 9 „	—	—	„	„	102
Garrison Hospital	„	„ T. Bailey	25	—	—	5 August	R. 17 August	„	Ward 20 C	3,877
[illegible]pment outside Fort Manoel.	„	Lance-Corporal G. Page.	26	6 August	R. 9 August	—	—	„	Tent	102

Deaths from Diarrhœa and Cholera among Troops at Malta during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Limewashed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
	* From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Insufficient	Yes, frequently from old main drain.	None	From opening of city sewers.	From officers' stables.	Aqueduct	Sufficient	Good and clear.	Previous to regiment marching into Lower St. Elmo on 24th March 1865, and frequently since, as high as the iron racks, and round the base of the walls on the floors.	Bad	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
Good	No	No	No	No	Rainfall, stored in tank.	"	Fair, rather muddy, good taste.		Good	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
Insufficient	From opening of sewers.	"	"	"	Aqueduct	"	Good and clear.		Indifferent	Paymaster's clerk.
Good	No	"	"	"	Rainfall, stored in tank.	"	Fair, rather muddy, good taste.		Good	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	Employed in armourer's shop, Lower St. Elmo, daily, up to two days before attack.
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	Employed in armourer's shop, Lower St. Elmo, daily, up to date of attack.
"	"	"	"	"	"	"	"		"	
—	—	—	Unknown		—	—	—		—	This man was on guard when attacked.
Good	No	No	No	No	Rainfall, stored in tank.	Sufficient	Fair, rather muddy, good taste.		Good	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
"	"	"	"	"	"	"	"		"	
Sufficient	"	"	"	"	Aqueduct	"	Good and clear.	20 June	"	
Good	"	"	"	"	Rainfall, stored in tank.	"	Fair, rather muddy, good taste.	—	"	
—										
"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	—	"	
Sufficient	"	"	"	"	Aqueduct	"	Good and clear.	20 June	"	
Good	"	"	"	"	Rainfall stored in tank.	"	Fair, rather muddy, good taste.	—	"	
"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	—	"	
Insufficient	Yes, especially from open drains outside 20 C ward.	Yes, from latrines outside ward.	Yes, especially from outside 20 C ward.	"	Aqueduct	"	Good and clear.	May	Bad	Hospital Orderly.
Good	No	No	No	"	Rainfall stored in tank.	"	Fair, rather muddy, good taste.	—	Good	

* Drainage of Lower St. Elmo re-modelled and improved during epidemic whilst barracks were vacant.

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
Barracks.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
Encampment outside Fort Manoel.	100th Regiment	Private J. Brady -	Yrs. 26	8 August -	R. 10 August	—	—	Ground Floor	Tent	102
„ -	„	„ P. Doherty -	30	—	—	8 August -	9 August -	„	„	102
„ -	„	„ J. Tracey -	25	—	—	9 „ -	R. 18 August	„	„	102
„ -	„	„ F. McCormack	28	9 August -	R. 11 August	—	—	„	„	102
Lower St. Elmo -	„	„ J. Bird -	23	—	—	10 August -	11 August -	2nd Floor	Bavaria 31	2,106
Encampment outside Fort Manoel.	„	Colour-Serjeant Jno. Bonet.	29	10 August -	R. 24 August	—	—	Ground Floor	Tent	513
„ -	„	Acts. Serjeant W. Cusler	32	10 „ -	R. 14 „	—	—	„	„	513
Crown Work -	„	Private S. Conroy -	36	13 „ -	R. 18 „	—	—	„	14	Married
Encampment outside Fort Manoel.	„	Colour-Serjeant T. Casey.	28	14 „ -	R. 27 „	—	—	„	Tent	513
„ -	„	Private W. Elliott -	33	15 „ -	R. 1 Sept. -	—	—	„	„	102
„ -	„	Corporal W. Richardson.	24	16 „ -	R. 19 August	—	—	„	„	102
Crown Work -	„	Private W. Geemon -	35	16 „ -	R. 21 „	—	—	„	4	Married
Encampment outside Fort Manoel.	„	„ W. Kincade -	27	17 „ -	R. 27 „	—	—	„	Tent	102
„ -	„	„ G. Lascelles -	35	19 „ -	R. 11 Oct. -	—	—	„	„	102
„ -	„	„ J. Roddy -	36	20 „ -	R. 23 August	—	—	„	„	102
Garrison Hospital -	„	„ E. Caldwell -	29	24 „ -	R. 30 „	—	—	2nd Floor	Ward 34	1,908
Encampment outside Fort Manoel.	„	„ D. Jordan -	26	26 „ -	R. 30 „	—	—	Ground Floor	Tent	102
„ -	„	„ C. Collins -	34	27 „ -	R. 1 Sept. -	—	—	„	„	102
„ -	„	„ Wm. McGrath	25	27 „ -	R. 4 „ -	—	—	„	„	102
Lower St. Elmo Prison.	„	„ Wm. Calib -	28	28 „ -	R. 11 Oct. -	—	—	„	Military Prison.	Unknown
Encampment outside Fort Manoel.	„	„ M. Mooney -	29	1 Sept. -	R. 9 Sept. -	—	—	„	Tent	102
„ -	„	Serjeant J. Bundy -	24	1 „ -	R. 8 „ -	—	—	„	„	102
„ -	„	Private Wm. Horsack	30	2 „ -	R. 7 „ -	—	—	„	„	102
„ -	„	Serjeant T. Casey -	28	7 „ -	R. 18 „ -	—	—	„	„	102
Crown Work -	„	Private W. Flanichan	33	22 „ -	R. 21 Oct. -	—	—	„	10	Married
Encampment outside Fort Manoel	„	„ E. Bedord -	26	25 „ -	R. 2 „ -	—	—	„	Tent	102
„ -	„	„ J. Neill -	33	28 „ -	R. 12 „ -	—	—	„	„	102
Lower St. Elmo -	„	„ J. Bruce -	34	29 „ -	R. 4 „ -	—	—	2nd Floor	13	798
-	„	„ O. Cox -	33	2 October -	R. 6 Jan. 1866.	—	—	„	2	602
Pembroke Camp -	„	„ M. Toole -	32	3 „ -	R. 15 Oct. 1865.	—	—	Ground Floor	Pembroke Camp.	Unknown
Lower St. Elmo -	„	„ J. Aitken -	25	11 „ -	R. 16 „ -	—	—	1st Floor	8	1,241
„ -	„	„ P. Lond -	34	11 „ -	R. 27 „ -	—	—	„	3	876
„ -	„	„ D. Gibbs -	20	15 „ -	R. 18 „ -	—	—	„	Band	—
„ -	„	„ H. Andrews -	35	16 „ -	R. 23 „ -	—	—	„	12	1,012
„ -	„	„ W. Symons' -	29	20 „ -	R. 27 „ -	—	—	2nd Floor	5	789
„ -	„	„ J. Cooper -	26	22 „ -	R. 30 „ -	—	—	1st Floor	12	1,065
„ -	„	„ D. O'Neil -	25	25 „ -	R. 30 „ -	—	—	2nd Floor	5	789
„ -	„	„ J. Smith -	34	29 „ -	R. 2 Nov. -	—	—	„	6	903
„ -	„	„ T. Lyons -	27	29 „ -	R. 1 „ -	—	—	1st Floor	12	936
„ -	„	„ J. Webber -	25	—	—	3 November	R. 8 Nov. -	Ground Floor	6	Married

from Diarrhœa and Cholera among Troops at Malta during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance [illegible]nced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
	*From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Good	No	No	No	No	Rainfall stored in tank.	Sufficient	Fair, rather muddy, good taste.	—	Good	—
"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	—	"	—
Insufficient	Yes, frequently from old main drains.	"	From opening of city sewers.	From officers' stables.	Aqueduct	"	Good and clear.	—	Indifferent	An officer's groom. Slept at Auberge de Baviere.
Good	No	"	No	No	Rainfall stored in tank.	"	Fair, rather muddy, good taste.	—	Good	—
"	"	"	"	"	"	"	"	—	"	—
Sufficient	"	"	"	"	Aqueduct	"	Good and clear.	20 June	"	—
Good	"	"	"	"	Rainfall stored in tank.	"	Fair, rather muddy, good taste.	—	"	—
"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	—	"	—
Sufficient	"	"	"	"	Aqueduct	"	Good and clear.	20 June	"	—
Good	"	"	"	"	Rainfall stored in tank.	"	Fair, rather muddy, good taste.	—	"	—
"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	—	"	—
Sufficient	"	Yes	Yes	"	Aqueduct	"	Good and clear.	May	Bad	Hospital Orderly.
Good	"	No	No	"	Rainfall stored in tank.	"	Fair, rather muddy, good taste.	—	Good	—
"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	—	"	—
Unknown	Yes, frequently from old main drain.	"	From opening of city sewers.	From officers' stables.	Aqueduct	"	Good and clear.	—	Bad	—
Good	No	"	No	No	Rainfall stored in tank.	"	Fair, rather muddy, good taste.	—	Good	—
"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	—	"	—
Sufficient	"	"	"	"	Aqueduct	"	Good and clear.	20 June	"	—
Good	"	"	"	"	Rainfall stored in tank.	"	Fair, rather muddy, good taste.	—	"	—
"	"	"	"	"	"	"	"	—	"	—
Insufficient	Yes, frequently from old main drain.	"	From opening of city sewers.	From officers' stables.	Aqueduct	"	Good and clear.	August	Bad	—
"	"	"	"	"	"	"	"	"	"	—
—	—	—	—	—	Unknown	—	—	—	—	This man was at Pembroke Camp for rifle practice.
Insufficient	Yes, frequently from old main drain.	No	From opening of city sewers.	From officers' stables.	Aqueduct	Sufficient	Good and clear.	August	Bad	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—

* Drainage of Lower St. Elmo re-modelled and improved during epidemic whilst barracks were vacant.

J. SMITH CHARTERS, Surgeon, 100th P.W.R.C. Regiment.

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
Barracks.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
St. Francis Barracks	Royal Engineers	Daniel McKindley -	Yrs. 28	13 July -	—	—	—	Ground Floor	5	850
„	„	C. Newbold - -	31	29 „ -	—	—	—	„	6	850
„ -	„	P. Wynne - -	25	1 August -	—	—	—	„	5	850
„ -	„	G. Frost - -	32	1 „ -	—	—	—	„	5	850
„ -	„	J. Hopkins - -	27	3 „ -	6 August -	—	—	2nd or Upper Floor.	9	1,012
„ -	„	J. Holdsworth -	32	3 „ -	—	—	—	„	9	1,012
„ -	„	R. Taylor - -	26	12 „ -	—	—	—	„	8	905
„ -	„	C. Gap - - -	28	19 „ -	—	—	—	„	9	1,012
„ -	„	T. Anderson - -	23	28 „ -	—	—	—	Ground Floor	5	850
„ -	„	D. King - -	32	7 Sept.	—	—	—	2nd or Upper Floor.	9	1,012
Floriana - -	2nd Battalion 4th Regiment.	Private Joseph Wilson	25	11 July -	15 July -	—	—	Ground Floor	1	769
„ - -	„	„ Griffin Bond -	26	—	—	13 July -	13 July -	„	2	807
Notre Dame Ravelin.	„	„ Joseph Grealey	26	12 July -	Recovered	—	—	„	Hut 3	550
Floriana - -	„	Corporal Wm. Johnson	24	14 „ -	„	—	—	„	Room 2	807
„ - -	„	„ John Fitzgerald.	27	13 „ -	„	—	—	„	„ 6	807
„ - -	„	Private Isaac Cautrill	25	13 „ -	„	—	—	„	„ 2	807
„ - -	„	„ Samuel Allen	25	—	—	13 July -	Recovered	„	„ 5	807
„ - -	„	„ Miles Hudgins	26	—	—	14 „ -	15 July -	„	„ 4	807
„ - -	„	Corporal John Tierney	26	13 July -	Recovered	—	—	„	„ 9	844
Left Hornwork -	„	Lance-Corporal J. Law	36	—	—	16 July -	16 July -	„	Hut 10	1,340
Floriana - -	„	Private Thos. Hargreaves.	25	17 July -	22 July -	—	—	„	Room 6	807
Notre Dame Ravelin.	„	„ Nicholas Sara	24	16 „ -	Recovered	—	—	„	Hut 3	550
Floriana - -	„	„ John Carroll -	26	18 „ -	„	—	—	„	Room 3	828
„ - -	„	„ John Eastcott	27	16 „ -	„	—	—	„	„ 3	828
„ - -	„	„ Isaac Hadfield	30	19 „ -	„	—	—	„	„ 10	844
„ - -	„	„ Wm. Abrahart	27	18 „ -	„	—	—	„	„ 6	807
„ - -	„	„ Ed. Anson -	25	18 „ -	„	—	—	„	„ 3	828
„ - -	„	„ Chas. Merrit -	30	—	—	22 July -	23 July -	„	„ 9	844
„ - -	„	„ Ben. Evans -	26	—	—	23 „ -	23 „ -	„	„ 5	807
„ - -	„	„ John Williams	29	24 July -	Recovered	—	—	„	„ 6	807
„ - -	„	„ Henry Budd -	27	25 „ -	„	—	—	„	Tent	150
„ - -	„	„ Thos. Cameron	27	22 „ -	Died of cholera.	—	—	„	Room 4	807
„ - -	„	„ James Cave -	26	24 „ -	Recovered	—	—	„	„ 4	807
Encampment -	„	„ John Cooper -	30	—	—	25 July -	25 July -	„	„ 4	807
Left Hornwork -	„	„ Thos. Bell -	37	—	—	25 „ -	25 „ -	„	Hut 20	940
Encampment -	„	„ Samuel Rood	24	—	—	25 „ -	26 „ -	„	Room 2	807
„ - -	„	„ Wm. Ginghill	31	22 July -	Recovered	—	—	„	„ 7	803
Left Hornwork -	„	„ Wm. Walker -	29	—	—	26 July -	Recovered	„	Hut 20	940
Encampment -	„	„ James Longhurst.	30	26 July -	Recovered	—	—	„	Tent	150
„ - -	„	„ Thos. Cameron	27	—	—	27 July -	28 July -	„	„	150
„ - -	„	„ Wm. Bradman	27	27 July -	Recovered	—	—	„	„	150
„ - -	„	„ Thos. Hann -	25	27 „ -	„	—	—	„	„	150
„ - -	„	„ Henry Booker	24	27 „ -	„	—	—	„	„	150
„ - -	„	„ Henry Sheen	25	26 „ -	„	—	—	„	„	150
„ - -	„	„ Henry Budd -	27	—	—	27 July -	Recovered	„	„	150
[illegible] Hornwork -	„	„ John Carton -	37	—	—	28 „ -	29 July -	„	Hut 16	1,340
[illegible]ment -	„	„ Pk. Sweeney -	24	27 July -	Recovered	—	—	„	Tent	150

from Diarrhœa and Cholera among Troops at Malta, during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack. From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Water Supply at the Time of Attack. Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."	How long before the Attack had the affected Room been Limewashed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
Sufficient	—	—	—	—	Citta Vecchia.	Sufficient	Good	June	Indifferent	Barracks limewashed in June all over, and frequently since, as high as a man can reach.
"	—	—	—	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	"	"	—

WILLIAM FERGUSON, Assistant Surgeon, Royal Engineers.

Sufficient	None	None	None	None	Aqueduct	Sufficient	Good	1 month	Bad	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	Good	—
"	"	"	"	"	"	"	"	"	Bad	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
Barracks.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
			Yrs.							
Floriana barrack -	2nd Battalion 4th Regiment.	Private Geo. Percival -	25	25 July -	Recovered	—	—	Ground Floor	Room 7	803
Encampment -	„	„ Robt. Adams -	24	28 „ -	„	—	—	„	Tent	150
„ - -	„	„ Sam. Fouracre	27	28 „ -	„	—	—	„	„	150
„ - -	„	„ Ben. Roper -	29	—	—	29 July -	30 July -	„	„	150
„ - -	„	„ Richd. Dander	25	25 July -	Recovered	—	—	„	„	150
„ - -	„	„ Geo. Percival -	25	—	—	30 July -	Recovered	„	„	150
„ - -	„	Corporal A. Moore -	25	29 July -	Recovered	—	—	„	„	150
„ - -	„	Private James Forsyth	23	30 „ -	„	—	—	„	„	150
„ - -	„	„ Wm. Dear -	25	31 „ -	„	—	—	„	„	150
„ - -	„	„ Geo. Ball -	25	30 „ -	„	—	—	„	„	150
Gozo - - -	„	„ John Sawyer -	27	29 „ -	„	—	—	„	„	150
Floriana, Encampment.	„	„ Ed. Brown -	33	—	—	1 August -	2 August -	„	„	150
Encampment -	„	„ Henry Jones -	25	30 July -	Recovered	—	—	„	„	150
„ - -	„	„ Geo. Anderson	27	—	—	6 August -	7 August -	„	„	150
„ - -	„	„ John Wager -	25	6 August -	Recovered	—	—	„	„	150
„ - -	„	„ Cornelius Brown	26	4 „ -	„	—	—	„	„	150
„ - -	„	Serjeant Wm. Danby -	30	6 „ -	„	—	—	„	„	150
„ - -	„	Private Wm. Hill -	30	5 „ -	„	—	—	„	„	150
„ - -	„	„ John McCoy -	27	8 „ -	„	—	—	„	„	150
„ - -	„	„ Wm. Styles -	27	8 „ -	„	—	—	„	„	150
„ - -	„	„ John Woods -	26	10 „ -	„	—	—	„	„	150
„ - -	„	„ James Turner	25	9 „ -	„	—	—	„	„	150
„ - -	„	„ Robt. McNeilly	25	7 „ -	„	—	—	„	„	150
„ - -	„	Serjeant Jas. McIntosh	24	12 „ -	„	—	—	„	„	150
„ - -	„	Private James Barnes	34	9 „ -	„	—	—	„	„	150
„ - -	„	„ John Holt -	29	11 „ -	„	—	—	„	„	150
„ - -	„	„ Robt. McNeilly	25	—	—	12 August -	Recovered	„	„	150
„ - -	„	„ John Murphy	26	12 August -	Recovered	—	—	„	„	150
„ - -	„	„ Wm. Chambers	24	14 „ -	„	—	—	„	„	150
„ - -	„	„ Ed. Anson -	26	14 „ -	„	—	—	„	„	150
„ - -	„	„ John Halloran	26	—	—	17 August -	Recovered	„	„	150
„ - -	„	„ Geo. Fell -	33	17 August -	Recovered	—	—	„	„	150
„ - -	„	„ Ed. Porter -	24	17 „ -	„	—	—	„	„	150
„ - -	„	„ Ed. Hutchins	25	15 „ -	„	—	—	„	„	150
„ - -	„	„ Alfred Thompson.	24	—	—	19 August -	19 August -	„	„	150
„ - -	„	„ Ed. Dobbs -	32	19 August -	Recovered	—	—	„	„	150
„ - -	„	„ Thomas Fairclough.	28	24 „ -	„	—	—	„	„	150
„ - -	„	„ Arthur Lawrence.	27	20 „ -	„	—	—	„	„	150
„ - -	„	„ Danl. Dignam	26	—	—	25 August -	26 August -	„	„	150
„ - -	„	„ John O'Brien	26	25 August -	Recovered	—	—	„	„	150
„ - -	„	„ John Cox -	30	26 „ -	„	—	—	„	„	150
„ - -	„	„ John Carroll -	27	26 „ -	„	—	—	„	„	150
„ - -	„	„ William Duncombe.	24	27 „ -	„	—	—	„	„	150
„ - -	„	„ Ed. Porter -	24	28 „ -	„	—	—	„	„	150
„ - -	„	„ Ed. Anson -	26	5 September	„	—	—	„	„	150
„ - -	„	„ Wm. Ginghall	32	7 „	„	—	—	„	„	150
„ - -	„	„ Edw. Gallagher.	24	9 „	„	—	—	„	„	150
„ - -	„	„ Wm. Brooks -	26	—	—	15 September	16 September	„	„	150

Deaths from Diarrhœa and Cholera among Troops at Malta, during the Epidemic of 1865—*continued.*

	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.					
State of Ventilation: "Sufficient," "Insufficient."	From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."	How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	REMARKS.
Sufficient	None	None	None	None	Aqueduct	Sufficient	Good	47 days	Bad	—
"	"	"	"	"	"	"	"	Tent	Good	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths

Occupation when the Epidemic appeared.				Diarrhœa.		Cholera.				
Barracks.	Corps.	Name of Patient.	Age.	Date of Attack.	Date of Death.	Date of Attack.	Date of Death.	Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
			Yrs.							
Fort Verdala	84th Regiment	John Turner	26	—	—	17 August	Recovered	Ground Floor	31	490
"	"	George Little	31	17 August	Recovered	—	—	"	82	490
"	"	Edward Brown	19	18 "	"	—	—	1st Floor	74	490
Married Quarters, Polverista.	"	Frederick Latham	30	—	—	19 August	Recovered	2nd Floor	81	1,630
Fort Verdala	"	Walter Dooley	24	—	—	20 "	20 August	1st Floor	56	490
"	"	Nicholas Buckley	19	21 August	Recovered	—	—	Ground Floor	21	490
"	"	Thomas Brooks	23	21 "	"			"	21	490
"	"	John Warrington	33	22 "	"			1st Floor	53	490
"	"	Aaron Turner	26	23 "	"			Ground Floor	20	490
"	"	Denis McCarthy	30	23 "	"			1st Floor	56	490
"	"	Thomas Wilson	24	23 "	"			Ground Floor	16	490
"	"	John Dodd	28	25 "	"			"	13	490
"	"	Mark Waddington	23	26 "	"		—	1st Floor	82	490
Upper Vittoriosa Hospital.	"	Thomas Margerison	21	—	—	27 August	28 August	Ground Floor	10 Ward	1,100
Fort Verdala	"	John Guest	22	27 August	Recovered	—	—	1st Floor	82	490
Married Quarters, Polverista.	"	Daniel Dempsey	30	—	—	28 August	29 August	2nd Floor	83	1,630
Upper Vittoriosa Hospital.	"	John Butterworth	26	—	—	28 "	30 "	1st Floor	4 Ward	1,100
Fort Verdala	"	Samuel Smith	25	30 August	Recovered	—	—	Ground Floor	84	490
"	"	John Griffiths	24	—	—	31 August	31 August	1st Floor	56	490
"	"	Walter Hogg	32	1 September	Recovered	—	—	"	54	490
"	"	James Coleborne	26	1 "	"	—	—	Ground Floor	24	490
Sanatorium, Citta Vecchia.	"	Thomas Baron	30	—	—	2 September	4 September	Citta Vecchia	Citta Vecchia.	Citta Vecchia.
Fort Verdala	"	John Copeland	29	—	—	7 "	7 "	1st Floor	53	490
"	"	Thomas Howarth	28	—	—	7 "	Recovered	Ground Floor	86	490
"	"	Thomas Quinn	26	8 September	Recovered			"	20	490
"	"	William Saxby	29	8 "	"			1st Floor	53	490
"	"	Aaron Turner	26	9 "	"			Ground Floor	20	490
"	"	John Byrne	24	9 "	"			1st Floor	1	490
Upper Vittoriosa Hospital.	"	William Carr	30	—	—	9 September	Recovered	Ground Floor	10 Ward	1,100
Fort Verdala	"	George Greaves	27	—	—	12 "	12 September	1st Floor	63	490
"	"	Joseph Croft	21	12 September	Recovered	—	—	Ground Floor	86	490
"	"	Nicholas Buckley	19	14 "	"	—		"	21	490
"	"	John Turner	22	15 "	"			"	20	490
"	"	Thomas Driver	20	16 "	"			"	24	490
"	"	Joseph McDonald	35	16 "	"			"	14	490
"	"	Henry Wilson	25	16 "	"			1st Floor	72	490
"	"	Thomas Toole	18	18 "	"			"	72	490
"	"	Richard Sharpe	24	18 "	"			"	66	490
"	"	Spencer Claise	22	19 "	"	—	—	"	53	490
"	"	Michael Burke	20	—	—	20 September	Recovered	Ground Floor	66	490
"	"	Thomas Scott	25	—	—	20 "	26 September	"	67	490
"	"	Thomas Blakeley	29	20 September	Recovered	—	—	"	12	490
"	"	William McNess	23	—	—	21 September	21 September	"	4	490
"	"	Patrick Terling	20	21 September	Recovered	—	—	1st Floor	61	490
"	"	Edward O'Neil	21	21 "	"	—	—	"	63	490
"	"	John O'Connors	24	21 "	"	—	—	"	60	490
"	"	William Thompson	26	—	—	21 September	22 September	"	53	490
"	"	Martin McGuire	26	21 September	Recovered	—	—	"	52	490
"	"	Jeremiah Crawley	24	21 "	"	—	—	"	1	490
"	"	Patrick Dempsey	21	—	—	21 September	Recovered	Ground Floor	65	490
Upper Vittoriosa Hospital.	"	Samuel Crossley	34	21 September	Recovered	—	—	1st Floor	66	490
Fort Verdala	"	John Burton	23	21 "	"	—	—	Ground Floor	67	490
"	"	George Banks	22	21 "	"	—	—	"	86	490

from Diarrhœa and Cholera among Troops at Malta, during the Epidemic of 1865—*continued*.

Any Nuisance experienced at the Time of Attack.					Water Supply at the Time of Attack.					
State of Ventilation: "Sufficient," "Insufficient."	From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."	How long before the Attack had the affected Room been Limewashed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
Insufficient	No	No	No	No	Rain water	Sufficient	Good	Whitewashed in August 1865.	Indifferent	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
Sufficient	"	"	"	"	"	"	"		Good	—
Insufficient	"	"	"	"	"	"	"		Indifferent	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	Yes	Yes	Yes	Yes	"	"	"		Bad	—
"	No	No	No	No	"	"	"		Indifferent	—
Sufficient	"	"	"	"	"	"	"		Good	—
Insufficient	Yes	Yes	Yes	Yes	"	"	"		Bad	—
"	No	No	No	No	"	"	"		[illegible]	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
Citta Vecchia Insufficient	Citta Vecchia No	Citta Vecchia No	Citta Vecchia No	Citta Vecchia. No	Citta Vecchia. Rain water	Citta Vecchia. Sufficient	Citta Vecchia. Good	Citta Vecchia.	"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	Yes	Yes	Yes	Yes	"	"	"		Bad	—
"	No	No	No	No	"	"	"		Indifferent	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths

Occupation when the Epidemic appeared.				Diarrhœa.		Cholera.				
Barracks.	Corps.	Name of Patient.	Age.	Date of Attack.	Date of Death.	Date of Attack.	Date of Death.	Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
			Yrs.							
Fort Verdala -	84th Regiment	Michael Masterson -	34	21 September	Recovered	—	—	Ground Floor	69	490
„ -	„	Patrick Dwyer -	24	21 „	„	—	—	„	69	490
„ -	„	John Margerson -	23	21 „	„	—	—	„	12	490
„ -	„	Ferdin. Mould -	24	22 „	„	—	—	„	14	490
Sanatorium Città Vecchia.	„	Henry Skelton -	19	—	—	22 September	25 September	Città Vecchia	Città Vecchia.	Città Vecchia.
Fort Verdala -	„	Joseph Gould -	24	24 September	Recovered	—	—	Ground Floor	31	490
„ -	„	Thomas Findley	24	24 „	„	—	—	„	31	490
„ -	„	William McGuire -	21	24 „	„	—	—	1st Floor	56	490
Upper Vittoriosa Hospital.	„	Samuel Crossley -	34	—	—	25 September	26 September	„	4 ward	1,100
Pembroke Camp -	„	Edward Batley -	23	25 September	Recovered	—	—	Ground Floor	Pembroke Camp.	650
Fort Verdala -	„	Matthew Donnelly -	27	26 „	„	—	—	1st Floor	84	490
Pembroke Camp -	„	George Graham -	29	27 „	„	—	—	Ground Floor	Pembroke Camp.	630
Fort Verdala -	„	Abraham Pilling -	37	27 „	„	—	—	1st Floor	73	490
„ -	„	Alfred Wood -	21	27 „	„	—	—	„	92	490
„ -	„	William Townsend -	25	—	—	27 September	Recovered	Ground Floor	15	490
„ -	„	William Saxby -	29	27 September	Recovered	—	—	1st Floor	53	490
„ -	„	William Vann -	19	27 „	„	—	—	„	56	490
„ -	„	Michael Costello -	24	28 „	„	—	—	„	56	490
„ -	„	William Fitzgerald -	22	28 „	„	—	—	„	91	490
„	„	Denis McCarthy -	30	1 October -	„	—	—	„	56	490
„	„	William Polson -	19	1 „	„	—	—	„	63	490
[illegible]mbroke	„	Joseph McDonald -	35	14 „ -	„	—	—	Ground Floor	Pembroke Camp.	630
[illegible]	1st Battalion 22nd Regiment	Private Richd. Hobson	26	23 July -	Recovered	—	—	Ground Floor	1	648
St. John's Curtain -	„	„ Thomas Ross	38	—	—	26 July -	29 July -	„	199	235
St. Francesco di Poalo.	„	„ Hy. McArdle	26	—	—	8 August -	Recovered	„	2	748
Isola Gate - -	„	„ John Collins -	43	8 August -	Recovered	—	—	1st Floor	4	767
Polverista Gate -	„	Colour-Serjeant Wm. Kay.	31	—	—	9 August -	Recovered	Ground Floor	10	3,762
Isola Gate - -	„	Private Richard Rolfe	31	11 August -	Recovered	—	—	„	9 and 10	925
„ -	„	„ Henry Petty	28	—	—	12 August -	Recovered	„	12	1,164
„ -	„	„ Saml. Cooper	29	12 August -	Recovered	—	—	„	12	1,164
St. John's Curtain -	„	„ Robert Sitton	39	—	—	14 August -	16 August -	„	207	294
Polverista Gate -	„	„ Geo. Roberts	24	15 August -	Recovered	—	—	„	14	752
„ -	„	„ William May	25	16 „ -	„	—	—	„	1	752
„ -	„	„ Thomas Haywood.	33	—	—	17 August -	19 August -	„	Left Casemate Polverista	941
Lower Vittoriosa Hospital.	„	„ Thos. Hayes -	39	—	—	17 „ -	17 „ -	2nd Floor	1	4,290
Polverista Gate -	„	„ Danl. Harding	30	17 August -	Recovered	—	—	Ground Floor	19	752
Officers' Quarters, Isola Gate.	„	Quarter-Master Walter Jones.	42	—	—	18 August -	18 August -	„	4	7,614
Polverista Gate -	„	Private Wm. Holland	28	18 August -	Recovered	—	—	„	1	752
Isola Gate - -	„	„ Wm. Jackson	31	19 „ -	„	—	—	„	12	1,164
St. Francesco di Poalo.	„	„ Hy. Harbury	29	—	—	20 August -	20 August -	„	16	1,176
St. John's Curtain -	„	„ James Dooge	29	20 August -	Recovered	—	—	„	179	294
Polverista Gate -	„	„ James Vane -	28	20 „ -	„	—	—	„	14	752
„ -	„	„ Patrick Hyland.	29	21 „ -	„	—	—	„	Right Casemate Polverista	941
St. Francesco di Poalo.	„	„ James Robinson.	29	23 „ -	„	—	—	„	2	728
Polverista Gate -	„	„ Thomas Bates	32	25 „ -	„	—	—	„	2	752
Isola Gate - -	„	„ Saml. Cooper	29	26 „ -	„	—	—	„	12	1,164
„ -	„	„ Michael Masterson.	27	—	—	1 Sept. -	1 Sept. -	„	11	1,082
[illegible]sta Gate -	„	„ Geo. Bartlett	27	2 Sept. -	Recovered	—	—	„	Right Casemate Polverista	941

from Diarrhœa and Cholera among Troops at Malta, during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Limewashed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
	From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Insufficient	Yes	No	No	No	Rain water	Sufficient	Good	Whitewashed in August 1865.	Indifferent	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
Citta Vecchia	Citta Vecchia	Citta Vecchia	Citta Vecchia	Citta Vecchia	"	"	"		Citta Vecchia	—
Insufficient	No	No	No	No	"	"	"		Indifferent	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	Yes	Yes	Yes	Yes	"	"	"		Bad	—
Sufficient	No	No	No	No	"	"	"		Good	—
Insufficient	"	"	"	"	"	"	"		Indifferent	—
Sufficient	"	"	"	"	"	"	"		Good	—
Insufficient	"	"	"	"	"	"	"		Indifferent	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		"	—
"	"	"	"	"	"	"	"		Good	—
Insufficient	—	—	1	—	Aqueduct & rain water.	Sufficient	Good	3 months	Bad	—
"	—	1	—	—	"	"	"	"	Good	—
"	—	—	1	—	"	"	"	4 months	Bad	—
"	—	—	1	—	"	"	"	"	"	—
Sufficient	—	1	—	—	"	"	"	"	Good	—
Insufficient	—	—	1	—	"	"	"	"	Bad	—
"	—	—	1	—	"	"	"	"	"	—
"	—	—	1	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	"	Good	—
"	—	1	—	—	"	"	"	"	"	—
"	—	1	—	—	"	"	"	"	"	—
"	—	1	—	—	"	"	"	"	"	—
Sufficient	—	—	1	—	"	"	"	1 month	Bad	—
Insufficient	—	—	—	—	"	"	"	4 months	Good	—
Sufficient	—	—	1	—	"	"	"	"	Bad	—
Insufficient	—	—	—	—	"	"	"	"	Good	—
"	—	—	1	—	"	"	"	"	Bad	—
"	—	—	1	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	"	Good	—
"	—	1	—	—	"	"	"	"	"	—
"	—	1	—	—	"	"	"	"	"	—
"	—	—	1	—	"	"	"	"	Bad	—
"	—	1	—	—	"	"	"	"	Good	—
"	—	—	1	—	"	"	"	"	Bad	—
"	—	—	1	—	"	"	"	"	"	—
"	—	1	—	—	"	"	"	"	Good	—

P. J. CLARKE, Surgeon, 84th Regiment.

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths

Occupation when the Epidemic appeared.				Diarrhœa.		Cholera.				
Barracks.	Corps.	Name of Patient.	Age.	Date of Attack.	Date of Death.	Date of Attack.	Date of Death.	Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
			Yrs.							
St. Francesco di Paolo.	1st Battalion 22nd Regiment.	Private Jas. Farmery	25	—	—	3 Sept.	Recovered	Ground Floor	15	1,311
„	„	„ Thomas Jones	25	15 Sept.	Recovered	—	—	„	1	648
Isola Gate	„	„ Fredk. Kent	28	—	—	24 Sept.	29 Sept.	1st Floor	4	675
Burmola Curtain	„	„ David Brookman.	37	—	—	25 „	27 „	„	4	864
Isola Gate	„	„ Joseph Sparrow.	22	26 Sept.	Recovered	—	—	„	5	1,152
„	„	„ John Sharps	25	27 „	„	—	—	Ground Floor	9 and 10	925
Polverista Gate	„	Dr. John Connor	33	—	—	1 October	Recovered.	„	17	752
„	„	Private George Pink	31	1 October	Recovered	—	—	„	11	752
Isola Gate	„	„ John Vahey	24	27 „	„	—	—	„	1	612
Fort Ricasoli	29th Foot	Martin Goggins	38	—	—	6 July	8 July	Ground Floor	53	625
„	„	John McKay	22	7 July	Recovered	—	—	„	7	626
„	„	Henry Wharton	18	7 „	„	—	—	„	6	626
„	„	John Jones	20	8 „	„	—	—	„	11	626
Pembroke Camp	„	Edward Rodgers	20	11 „	„	—	—	„	8	630
Fort Ricasoli	„	Joseph Lomas	24	12 „	„	—	—	„	13	626
„	„	Benjamin Bradly	19	13 „	„	—	—	„	5	626
„	„	James Kelly	22	15 „	„	—	—	„	6	626
„	„	Samuel Rideout	27	15 „	„	—	—	„	13	626
„	„	James Gannon	22	15 „	„	—	—	„	5	626
Pembroke Camp	„	William Haynes	22	17 „	„	—	—	„	3	630
Fort Ricasoli	„	Hugh Blackford	21	18 „	„	—	—	„	Hut 1	626
„	„	Henry Wharton	18	20 „	„	—	—	„	6	626
„	„	John Marshall	34	20 „	„	—	—	„	12	626
„	„	Frederick Dobson	18	22 „	„	—	—	„	Hut 2	626
„	„	Henry Bond	24	22 „	„	—	—	„	„	626
„	„	Joseph Bevington.	23	22 „	„	—	—	„	„	626
„	„	John Jones	21	24 „	„	—	—	„	Room 11	626
Pembroke Camp	„	John Kane	24	24 „	„	—	—	„	16	630
Fort Ricasoli	„	Michael White	26	25 „	„	—	—	„	45	626
„	„	William Vickery	19	26 „	„	—	—	„	6	626
„	„	Moses Kelly	34	27 „	„	—	—	„	6	626
„	„	John Davis	23	28 „	„	—	—	„	5	626
„	„	Samuel Rideout	25	28 „	„	—	—	„	13	626
Pembroke Camp	„	John Fearn	20	28 „	„	—	—	„	2	630
„	„	George Weaver	20	31 „	„	—	—	„	8	630
„	„	Robert McHale	19	1 August	„	—	—	„	16	630
„	„	Joseph Dunkley	26	2 „	„	—	—	„	2	630
„	„	Henry Elner	25	2 „	„	—	—	„	3	630
Fort Ricasoli	„	Joseph Robinson	23	3 „	„	—	—	„	6	626
Pembroke Camp	„	James Clatworthy	32	3 „	„	—	—	„	10	630
„	„	Joseph Brutton	28	4 „	„	—	—	„	4	630
„	„	John Jarvis	35	—	—	4 August	5 August	„	Married quarters 6.	630
„	„	William Briggs	20	—	—	4 „	6 „	„	12	630
„	„	John Norton	24	5 August	Recovered	—	—	„	12	630
„	„	John Brindley	20	7 „	„	—	—	„	7	630
„	„	John Andrews	25	9 „	„	—	—	„	2	630
„	„	James Murray	23	9 „	„	—	—	„	2	630
„	„	Thomas McCale	22	10 „	„	—	—	„	3	630
„	„	Charles Mayers	25	9 „	„	—	—	„	3	630
[illegible]oli	„	Henry Clare	19	10 „	„	—	—	„	6	626

from Diarrhœa and Cholera among Troops at Malta, during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack. From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Water Supply at the Time of Attack. Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."	How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	REMARKS.
Insufficient	—	—	1	—	Aqueduct & rain water..	Sufficient	Good	4 months	Bad	—
"	—	—	1	—	"	"	"	5 months	"	—
"	—	—	1	—	"	"	"	"	"	—
Sufficient	—	—	1	—	"	"	"	2 months	"	—
Insufficient	—	—	1	—	"	"	"	5 months	"	—
"	—	—	1	—	"	"	"	"	"	—
"	—	1	—	—	"	"	"	"	Good	—
"	—	1	—	—	"	"	"	"	"	—
"	—	—	1	—	"	"	"	"	Bad	—

A. L. ADAMS, SURGEON, 1ST BATTALION, 22ND REGIMENT.

Insufficient	No	No	No	No	Rain water from tanks.	Sufficient	Good	6 months	Good	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
Sufficient	"	"	"	"	"	"	"	"	"	—
Insufficient	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
Sufficient	"	"	"	"	"	"	"	"	"	—
Insufficient	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
Sufficient	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	2 weeks	"	—
"	"	"	"	"	"	"	"	"	"	—
Insufficient	"	"	"	"	"	"	"	"	"	—
Sufficient	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
Insufficient	"	"	"	"	"	"	"	"	"	—

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths

Occupation when the Epidemic appeared.		Diarrhœa.				Cholera.					
Barracks.	Corps.	Name of Patient.	Age.	Date of Attack.	Date of Death.	Date of Attack.	Date of Death.	Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
Vittoriosa Hospital	29th Foot	Patrick O'Connor	Yrs. 22	—	—	11 August	12 August	1st Floor	6	1,100
Fort Ricasoli	„	John Walsh	26	12 August	Recovered		—	Ground Floor	5	626
„	„	Joseph Eaton	25	13 „	„	—	—	„	13	626
„	„	Michael Whittaker	24	13 „	„	—	—	„	12	626
„	„	William Ray	30	13 „	„	—	—	„	Hut 1	626
„	„	John Marshall	34	—	—	15 August	Recovered	„	Room 12	626
Pembroke Camp	„	James Courd	23	15 August	Recovered	—	—	„	2	630
„	„	Michael Boyle	22	15 „	„	—	—	„	12	630
Fort Ricasoli	„	Thomas Simmons	21	15 „	„	—	—	„	8	626
„	„	Henry Bond	24	16 „	„	—	—	„	Hut 2	626
Pembroke Camp	„	Thomas Jones	20	17 „	„	—	—	„	Room 6	630
Vittoriosa Hospital	„	Thomas Sturgess	23	—	—	17 August	20 August	1st Floor	6	1,100
Fort Ricasoli	„	Richard Nettleton	33	—	—	20 „	20 „	Ground Floor	8	626
Pembroke Camp	„	William Fox	18	20 August	Recovered	—	—	„	1	630
„	„	Thomas Cowan	20	20 „	„	—	—	„	11	630
Pembroke Camp (Forest Hospital).	„	Robert McMahon	24	—	—	21 August	22 August	„	Ward 1	1,165
Pembroke Camp	„	John Murray	24	23 August	Recovered	—	—	„	Room 2	630
„	„	John Whittingham	19	25 „	„	—	—	„	1	630
Fort Ricasoli	„	James Williams	24	25 „	„	—	—	„	13	626
„	„	James Bowen	24	—	—	26 August	28 August	„	6	626
„	„	John Aspinall	25	31 August	Recovered	—	—	„	12	626
Pembroke Camp	„	Henry Glover	22	—	—	1 September	1 September	„	2	630
„	„	John Vickery	29	—	—	1 „	10 „	„	1	630
Zabbar Gate	„	William Dobson	23	1 September	Recovered	—	—	„	2	650
Pembroke Camp	„	Stephen Rigby	18	2 „	„	—	—	„	3	630
„	„	Thomas McCabe	22	—	—	3 September	4 September	„	4	630
„	„	William Matthews	26	—	—	4 „	Recovered	„	2	630
„	„	Thomas Whelan	40	4 September	Recovered	—	—	„	Hut 2	630
„	„	John Murray	21	—	—	5 September	5 September	„	Room 2	630
Fort Ricasoli	„	John Cochrane	24	6 September	Recovered	—	—	„	5	626
Pembroke Camp	„	John Piper	24	8 „	„	—	—	„	16	630
Pembroke Camp (Forest Hospital).	„	William Frost	28	—	—	10 September	10 September	„	Ward 1	1,165
„	„	Michael McNamara	33	12 September	Recovered	—	—	„	Room 11	630
„	„	Daniel Murphy	24	12 „	„	—	—	„	2	630
„	„	Robert Chapman	21	13 „	„	—	—	„	3	630
Fort Ricasoli	„	William Smith	23	15 „	„	—	—	„	6	626
„	„	Thomas Cook	23	22 „	„	—	—	„	5	626
„	„	Michael Learey	29	22 „	„	—	—	„	6	626
„	„	Thomas Cowan	22	22 „	„	—	—	„	6	626
Zabbar Gate	„	Jeremiah Sullivan	21	22 „	„	—	—	„	6	650
„	„	John Slade	24	23 „	„	—	—	„	1	650
Fort Ricasoli	„	Michael Murray	32	23 „	„	—	—	„	6	626
„	„	Thomas Carr	23	24 „	„	—	—	„	Hut 4	626
„	„	William Lockhart	21	25 „	„	—	—	„	Room 6	626
„	„	John Dawson	23	25 „	„	—	—	„	—	626
„	„	Stephen O'Donnell	30	25 „	„	—	—	„	Room 6	626
„	„	Thomas Bowler	21	27 „	„	—	—	„	Hut 4	626
Zabbar Gate	„	William Hurst	23	2 October	„	—	—	„	5	650
„	„	Thomas Neal	28	2 „	„	—	—	„	1	650
„	„	Henry Phillips	19	2 „	„	—	—	„	3	650
Fort Ricasoli	„	Edward O'Hagan	24	4 „	„	—	—	„	6	626
„	„	Robert Wills	22	5 „	„	—	—	„	7	626
„	„	Henry Clarke	24	7 „	„	—	—	„	1	640

from Diarrhœa and Cholera among Troops at Malta, during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
	From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Insufficient	Yes	Yes	Yes	Yes	Rain water from tanks.	Sufficient	Good	2 weeks	Bad	—
„	No	No	No	No	„	„	„	„	Good	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
Sufficient	„	„	„	„	„	„	„	3 weeks	„	—
„	„	„	„	„	„	„	„	„	„	—
Insufficient	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
Sufficient	„	„	„	„	„	„	„	„	„	—
Insufficient	Yes	Yes	Yes	Yes	„	„	„	„	Bad	—
„	No	No	No	No	„	„	„	„	Good	—
„	„	„	„	„	„	„	„	1 month	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
Sufficient	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
Sufficient	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
Insufficient	„	„	„	„	„	„	„	5 weeks	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
Insufficient	„	„	„	„	„	„	„	„	„	—
Sufficient	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	6 weeks	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	„	„	—
Insufficient	„	„	„	„	„	„	„	„	„	—
„	„	„	„	„	„	„	„	2 days	„	—
„	„	„	„	„	„	„	„	2 „	„	—
„	„	„	„	„	„	„	„	2 „	„	—
Sufficient	„	„	„	„	„	„	„	2 „	„	—
„	„	„	„	„	„	„	„	2 „	„	—
Insufficient	„	„	„	„	„	„	„	3 „	„	—
„	„	„	„	„	„	„	„	3 „	„	—
„	„	„	„	„	„	„	„	4 „	„	—
„	„	„	„	„	„	„	„	5 „	„	—
„	„	„	„	„	„	„	„	5 „	„	—
„	„	„	„	„	„	„	„	5 „	„	—
Sufficient	„	„	„	„	„	„	„	5 „	„	—
„	„	„	„	„	„	„	„	5 „	„	—
„	„	„	„	„	„	„	„	5 „	„	—
Insufficient	„	„	„	„	„	„	„	14 „	„	—
„	„	„	„	„	„	„	„	15 „	„	—
Sufficient	„	„	„	„	„	„	„	15 „	„	—

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
Barracks.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
			Yrs.							
Fort Ricasoli -	29th Foot	Frederick Betteridge -	25	7 October	Recovered	—	—	Ground Floor	5	626
Zabbar Gate -	,,	Alfred Hewett -	24	7 ,,	,,	—	—	,,	5	650
Fort Ricasoli -	,,	Samuel Rideout -	26	8 ,,	,,	—	—	,,	13	626
,, -	,,	William Gibbs -	28	9 ,,	,,	—	—	,,	13	626
,, -	,,	William Blake -	30	1 ,,	,,	—	—	1st Floor	6	626
,, -	,,	Joseph King - -	24	12 ,,	,,	—	—	Ground Floor	7	626
Zabbar Gate -	,,	William Lowdin -	24	12 ,,	,,	—	—	,,	5	650
,, -	,,	John Norton - -	24	15 ,,	,,	—	—	,,	5	650
Fort Ricasoli -	,,	John Wilkinson -	32	18 ,,	,,	—	—	,,	Hut 5	626
Zabbar Gate -	,,	John Lambert -	20	18 ,,	,,	—	—	,,	Room 5	650
Fort Ricasoli -	,,	Thomas Ward -	20	20 ,,	,,	—	—	,,	Hut 4	626
,, -	,,	John Jones - -	20	21 ,,	,,	—	—	1st Floor	Room 7	626
Zabbar Gate -	,,	James Courd - -	23	—	—	23 October -	28 October -	Ground Floor	4	650
Fort Ricasoli -	,,	Jeremiah Sullivan -	22	23 October -	Recovered	—	—	,,	7	626
,, -	,,	Michael Winn - -	38	25 ,,	,,	—	—	,,	7	626
,, -	,,	John Davis - -	29	—	—	27 October -	28 October -	,,	5	626
Zabbar Gate -	,,	John Houmas - -	20	29 October -	Recovered	—	—	,,	2	650
Fort Ricasoli -	,,	Alfred Stokes - -	28	30 ,,	,,	—	—	,,	12	626
,, -	,,	Francis Ailes - -	25	—	—	30 October -	30 October -	,,	61	626
Pembroke Camp -	2nd Battalion 8th Regiment.	Private Richard Lissell	26	1 July -	—	—	—	Ground Floor	2	630
,, -	,,	,, Michael Butler	27	2 ,,	—	—	—	,,	6	630
,, -	,,	,, William Flynn	32	5 ,,	—	—	—	,,	8	630
,, -	,,	,, Thomas Herod	24	5 ,,	—	—	—	,,	5	630
,, -	,,	,, Edward Harris	29	7 ,,	—	—	—	,,	2	630
Fort Manoel -	,,	Dr. John Moore -	19	7 ,,	—	—	—	,,	12	983
Pembroke Camp -	,,	Private Thos. Knowles	38	9 ,,	—	—	—	,,	5	630
,, -	,,	Serjeant Israel Chard	31	9 ,,	—	—	—	,,	6	630
,, -	,,	Corporal John Brown	25	9 ,,	—	—	—	,,	4	630
,, -	,,	Private Wm. Compton	26	9 ,,	—	—	—	,,	2	630
Fort Manoel -	,,	,, Sam. Hutchins	42	10 ,,	—	—	—	,,	Lodgings	Unknown
Pembroke Camp -	,,	,, John Byers -	28	11 ,,	—	—	—	,,	2	630
Fort Manoel -	,,	,, Thomas Casey	26	14 ,,	—	—	—	,,	1	545
Pembroke Camp -	,,	,, John Kelly -	26	14 ,,	—	—	—	,,	3	630
,, -	,,	,, Benj. Brown -	25	16 ,,	—	—	—	,,	4	630
,, -	,,	,, Michael Mc Carthy.	23	16 ,,	—	—	—	,,	12	630
Fort Manoel -	,,	,, John Daley -	24	20 ,,	—	—	—	,,	1	545
Pembroke Camp -	,,	,, Wm. Braddish	26	28 ,,	—	—	—	,,	2	630
,, -	,,	,, James Ballard	26	—	—	27 July -	27 July -	,,	1	630
Fort Manoel -	,,	,, Samuel Dunn	26	29 July -	—	—	—	,,	1	545
,, -	,,	,, Fred. Louis -	20	31 ,,	—	—	—	,,	12	983
Pembroke Camp -	,,	,, John Murphy	30	31 ,,	—	—	—	,,	8	630
,, -	,,	,, Dnl. McMillan	26	31 ,,	—	—	—	,,	2	630
,, -	,,	,, Tim. Omearn	29	1 August -	—	—	—	,,	3	630
,, -	,,	,, Dan. McMillan	26	—	—	6 August -	6 August -	,,	2	630
Garrison Hospital -	,,	,, James Eades -	26	—	—	7 ,,	7 ,,	1st Floor	31	2500
Pembroke Camp -	,,	,, Wm. Damers	28	10 August -	—	—	—	Ground Floor	4	630
,, -	,,	,, Edw. Wooley	24	11 ,,	—	—	—	,,	6	630
,, -	,,	,, Anthony Smith	27	13 ,,	—	—	—	,,	2	630

from Diarrhœa and Cholera among Troops at Malta, during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter; "Good," "Indifferent," "Bad."	Remarks.
	From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Insufficient	No	No	No	No	Rain water from tanks.	Sufficient	Good	17 days	Good	—
Sufficient	,,	,,	,,	,,	,,	,,	,,	17 ,,	,,	—
Insufficient	,,	,,	,,	,,	,,	,,	,,	18 ,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	19 ,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	20 ,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	22 ,,	,,	—
Sufficient	,,	,,	,,	,,	,,	,,	,,	22 ,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	22 ,,	,,	—
Insufficient	,,	,,	,,	,,	,,	,,	,,	1 month	,,	—
Sufficient	,,	,,	,,	,,	,,	,,	,,	1 ,,	,,	—
Insufficient	,,	,,	,,	,,	,,	,,	,,	1 ,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	1 ,,	,,	—
Sufficient	,,	,,	,,	,,	,,	,,	,,	1 ,,	,,	—
Insufficient	,,	,,	,,	,,	,,	,,	,,	1 ,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	1 ,,	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	1 ,,	,,	—
Sufficient	,,	,,	,,	,,	,,	,,	,,	1 ,,	,,	—
Insufficient	,,	,,	,,	,,	,,	,,	,,	6 weeks	,,	—
,,	,,	,,	,,	,,	,,	,,	,,	6 ,,	,,	—

E. MOREHEAD, Surgeon-Major, 29th Regiment.

Sufficient	No	Occasionally	Occasionally from uncovered rear in neighbourhood.	No	Tanks	Sufficient	Good	2 months	Good	—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,	,,	,,		,,	,,	,,	,,	,,		—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,	,,	,,	No	,,	,,	,,	,,	6 months	,,	—
,,	,,	,,	Occasionally from uncovered rear in neighbourhood.	,,	,,	,,	,,	2 months	,,	—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,	,,	No	No	House close to wateredge.	,,	,,	,,	Not known	,,	—
,,	,,	Occasionally	—	No	,,	,,	,,	2 months	,,	—
,,	,,	No	No	,,	,,	,,	Bad taste	6 months	,,	—
,,	,,	Occasionally	Occasionally from uncovered rear in neighbourhood.	,,	,,	,,	Good	2 months	,,	—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,	,,	Before cleaning in morning.	None	,,	,,	,,	Bad taste	6 months	,,	—
,,	,,	Occasionally	Occasionally from uncovered rear in neighbourhood.	,,	,,	,,	Good	2 months	,,	—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,	,,	Before cleaning in morning.	None	,,	,,	,,	Bad taste	6 months	,,	—
,,	,,	Occasionally	,,	,,	,,	,,	,,	6 months	,,	—
,,	,,	,,	Occasionally from uncovered rear in neighbourhood.	,,	,,	,,	Good	2 months	,,	—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,	,,	,,		,,	,,	,,	,,	3 months	,,	—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,	,,	None	None	,,	,,	,,	,,	1 month	,,	—
,,	,,	Occasionally	Occasionally from uncovered rear in neighbourhood.	,,	,,	,,	,,	3 months	,,	—
,,	,,	,,		,,	,,	,,	,,	,,	,,	—
,,				,,	,,	,,	,,	,,	,,	—

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
Barracks.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
			Yrs.							
Fort Manoel	2nd Battalion 8th Regiment.	Private George Russ	27	16 August	—	—	—	Ground Floor	1	545
Pembroke Camp	"	" Rody Kelly	25	20 "	—	—	—	"	4	630
"	"	" Edw. Molloy	27	25 "	—	—	—	"	4	630
"	"	" Andrew Bright	24	30 "	—	—	—	"	1	630
"	"	" Step. Kennedy	25	30 "	—	—	—	"	3	630
"	"	" John Higgins	42	1 September	—	—	—	"	1	630
"	"	" Denis Donovan	26	2 "	—	—	—	"	4	630
"	"	" Thomas Gillis	26	5 "	—	—	—	"	8	630
"	"	" Thomas Britt	26	10 "	—	—	—	"	2	630
Forest Hospital	"	" John Murphy	25	—	—	11 September	11 September	"	—	800
Pembroke Camp	"	" Charles Evans	28	11 September	—	—	—	"	5	630
"	"	" Michael Gleeson.	27	8 October	—	—	—	"	1	630
Fort Manoel	"	" Thomas Gillis	26	10 "	—	—	—	"	1	545
Pembroke Camp	"	" Joseph Gastin	25	—	—	9 September	9 September	"	1	630
Fort Manoel	"	" Michael Nash	27	11 October	—	—	—	"	16	728
Pembroke Camp	"	" Patrick Healey	32	13 "	—	—	—	"	12	630
"	"	" JohnMcCarthy	25	16 "	—	—	—	"	4	630
"	"	" Patrick Robinson.	30	—	—	20 October	—	"	3	630
"	"	" Thomas Mc Carthy.	26	26 October	—	—	—	"	1	630
Fort Lascaris	Royal Malta Fencible Artillery.	Gunner J. Fammit	39	7 July	Recovered	—	—	2nd Floor	3	598
"	"	" L. Pella	37	10 "	"	—	—	"	7	822
"	"	Bombardier P. Mandi	28	11 "	"	—	—	1st Floor	16	407
Couvre Porte	"	Gunner S. Fenech	25	13 "	"	—	—	Ground Floor	4	714
"	"	" P. Cassar	25	14 "	"	—	—	"	9	659
Fort Lascaris	"	" P. Pella	18	19 "	"	—	—	2nd Floor	18	873
Sant' Elena	"	" G. Borg	17	20 "	"	—	—	Ground Floor	—	500
Fort Lascaris	"	" G. Pella	19	22 "	"	—	—	1st Floor	16	407
Couvre Porte	"	" P. Camana	24	—	—	22 July	Recovered	Ground Floor	2	600
Sant' Elena	"	" M. Pella	23	24 July	Recovered	—	—	"	—	500
Fort Lascaris	"	" F. Dannanin	32	24 "	"	—	—	2nd Floor	6	598
Sant' Elena	"	" M. A. Sultana	20	25 "	"	—	—	Ground Floor	—	500
Fort Lascaris	"	" Louis Avallo	49	25 "	"	—	—	2nd Floor	10	703
"	"	" P. Schembri	33	26 "	"	—	—	"	5	598
Sant' Elena	"	" G. Debour	24	27 "	"	—	—	Ground Floor	—	500
"	"	" L. Bellizri	15	2 August	"	—	—	"	—	500
Fort Lascaris	"	" F. Galea	18	2 "	"	—	—	1st Floor	14	407
Couvre Porte	"	Trumpeter C. Delfonso.	43	3 "	"	—	—	"	8	589
Fort Lascaris	"	Gunner G. Guch	45	7 "	"	—	—	2nd Floor	10	703
"	"	" G. Agius	19	7 "	"	—	—	"	14	407
"	"	" P. Schembri	33	11 "	"	—	—	"	5	598
"	"	" Ant. Borg	18	13 "	"	—	—	"	4	598
"	"	" Ant. Borg	18	—	—	14 August	Recovered	"	4	598
"	"	" E. Erniquez	24	14 August	Recovered	—	—	"	10	703
"	"	" L. Attard	26	16 "	"	—	—	"	10	703
Sant' Elena	"	Serjeant A. Camilleri	40	17 "	"	—	—	Ground Floor	—	500
Fort Lascaris	"	Gunner G. Pisani	24	18 "	"	—	—	1st Floor	15	407
	"	" A. Barbara	53	—	—	20 August	20 August	"	12	509
	"	" G. Pace	46	21 August	Recovered	—	—	2nd Floor	2	598

from Diarrhœa and Cholera among Troops at Malta, during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	REMARKS.
	From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Sufficient	No	Occasionally	No	None	Tanks	Sufficient	Bad taste	6 months	Good	—
„	„	„	Occasionally from uncovered rear in neighbourhood.	„	„	„	Good	3 months	„	—
„	„	„		„	„	„	„	„	„	—
„	„	„		„	„	„	„	„	„	—
„	„	„		„	„	„	„	„	„	—
„	„	„		„	„	„	„	4 months	„	—
„	„	„		„	„	„	„	„	„	—
„	„	„		„	„	„	„	„	„	—
„	„	„		„	„	„	„	„	„	—
„	„	None	None	„	„	„	„	6 months	„	—
„	„	Occasionally	Occasionally from rear in neighbourhood.	„	„	„	„	4 months	„	—
„	„	„		„	„	„	„	„	„	—
„	„	„	None	„	„	„	Bad taste	6 months	„	—
„	„	„	From rear in neighbourhood.	„	„	„	Good	4 months	„	—
„	„	„	None	„	„	„	Bad taste	6 months	„	—
„	„	„	Occasionally from uncovered rear in neighbourhood.	„	„	„	Good	5 months	„	—
„	„	„		„	„	„	„	„	„	—
„	„	„		„	„	„	„	„	„	—
„	„	„		„	„	„	„	„	„	—

JOHN MADDEN, Surgeon, 2nd Battalion, 8th (The King's) Regiment.

Sufficient	—	—	—	—	Aqueduct & rain water.	Sufficient	Good	1 month	Good	—
„	—	—	—	—	„	„	„	„	„	—
Insufficient	—	—	—	—	„	„	„	„	„	—
Sufficient	—	—	—	—	„	„	„	„	„	—
„	—	—	—	—	„	„	„	„	„	—
„	—	—	—	—	„	„	„	„	„	—
„	1	—	1	—	„	„	„	„	Bad	—
Insufficient	—	—	—	—	„	„	„	„	Good	—
Sufficient	—	—	—	—	„	„	„	„	„	—
„	1	—	1	—	„	„	„	„	Bad	—
„	—	—	—	—	„	„	„	„	Good	—
„	1	—	1	—	„	„	„	„	Bad	—
„	—	—	—	—	„	„	„	„	Good	—
„	—	—	—	—	„	„	„	„	„	—
„	1	—	1	—	„	„	„	„	Bad	—
„	—	—	—	—	„	„	„	2 months	„	—
Insufficient	—	—	—	—	„	„	„	„	Good	—
Sufficient	—	—	—	—	„	„	„	„	„	—
„	—	—	—	—	„	„	„	„	„	—
Insufficient	—	—	—	—	„	„	„	„	„	—
Sufficient	—	—	—	—	„	„	„	„	„	—
„	—	—	—	—	„	„	„	„	„	—
„	—	—	—	—	„	„	„	„	„	—
„	—	—	—	—	„	„	„	„	„	—
„	—	—	—	—	„	„	„	„	„	—
„	1	—	1	—	„	„	„	„	Bad	—
Insufficient	—	—	—	—	„	„	„	„	Good	—
„	—	—	—	—	„	„	„	„	„	—
Sufficient	—	—	—	—	„	„	„	„	„	—

TABLE XXI.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Man in Room at the Time of Attack.
Barracks.	Corps.		Yrs.	Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
Sant' Elena	Royal Malta Fencible Artillery.	Gunner G. Deplin	25	22 August	Recovered	—	—	Ground Floor	—	500
Fort Lascaris	"	" C. Xuereb	23	26 "	"	—	—	1st Floor	15	407
Sant' Elena	"	" F. Montebello	34	30 "	"	—	—	Ground Floor	—	500
*	"	Serjeant G. Pella	37	1 Sept.	"	—	—	3rd Floor	None	Not known.
Fort Lascaris	"	Gunner, G. Agins	23	1 "	"	—	—	1st Floor	18	873
"	"	" A. Mallia	23	—	—	1 Sept.	2 Sept.	"	15	407
Regimental Hospital	"	" P. Pace	50	2 Sept.	Recovered	—	—	Ward 50	—	2,665
Fort Lascaris	"	" M. Arzopardo	41	2 "	"	—	—	2nd Floor	3	598
Couvre Porte	"	Bombardier C. Covacintto.	27	3 "	"	—	—	Ground Floor	4	714
Sant' Elena	"	Gunner L. Bellizri	15	3 "	"	—	—	"	—	500
"	"	" G. Berzina	33	4 "	"	—	—	"	—	500
Fort Lascaris	"	" Ant. Borg	54	4 "	"	—	—	1st Floor	15	407
"	"	Corporal G. Bologna	26	4 "	"	—	—	2nd Floor	9	598
"	"	Gunner P. Pauli	31	4 "	"	—	—	Ground Floor	—	500
"	"	" Ant. Borg	54	—	—	4 Sept.	7 Sept.	1st Floor	15	407
*	"	Serjeant G. Vella	37	5 Sept.	Recovered	—	—	3rd Floor	None	Not known.
Sant' Elena	"	Gunner F. Grech	19	6 "		—	—	Ground Floor	—	500
Fort Lascaris	"	" A. Grech	26	6 "		—	—	2nd Floor	6	598
"	"	" F. Dannanin	27	6 "	"	—	—	"	9	598
"	"	Bombardier P. Mandi	28	—	—	6 Sept.	Recovered	1st Floor	16	407
"	"	Gunner G. Pella	19	7 Sept.	Recovered	—	—	"	16	407
Sant' Elena	"	" M. Bonello	17	7 "	"	—	—	Ground Floor	—	500
Fort Lascaris	"	" F. Cilia	27	7 "	"	—	—	2nd Floor	9	598
"	"	Acting Bombardier, A. Camilleri.	56	—	—	7 Sept.	Recovered	1st Floor	15	560
"	"	Trumpeter G. Attard	23	8 Sept.	Recovered	—	—	2nd Floor	3	593
*	"	Gunner P. Fanugia	45	8 "	"	—	—	3rd Floor	—	800
"	"	Gunner G. M. Heni	34	8 "	—	—	—	2nd Floor	1	593
"	"	" M. Agins	23	9 "	—	—	—	1st Floor	14	407
"	"	" C. Spiteri	25	10 "	—	—	—	2nd Floor	7	822
"	"	" G. Vella	19	10 "	—	—	—	1st Floor	16	407
"	"	Serjeant F Ganci	54	—	—	10 Sept.	16 Sept.	"	10	703
"	"	Serjeant - Major G. Barbara.	48	10 Sept.	—	—	—	2nd Floor	2	8,372
*	"	Serjeant P. Andibut	32	12 "	—	—	—	"	None	Not known.
Fort Lascaris	"	Gunner F. Dannanin	36	13 "	—	—	—	"	3	598
"	"	" G. Busuttil	20	14 "	—	—	—	1st Floor	14	407
"	"	" C. Micallef	24	—	—	16 Sept.	Recovered	2nd Floor	9	598
Couvre Porte	"	" G. Cremona	17	16 Sept.	—	—	—	Ground Floor	4	714
"	"	Bombadier G. Covacciotto.	27	17 "	—	—	—	"	4	714
"	"	Gunner G. M. Ciantar	21	17 "	—	—	—	"	2	600
Fort Lascaris	"	" C. Bonavia	25	22 "	—	—	—	2nd Floor	7	822
"	"	" A. Magio	26	23 "	—	—	—	"	10	703
Sant' Elena	"	" S. Mamo	28	24 "	—	—	—	Ground Floor	—	500
Fort Lascaris	"	" P. Pabono	27	29 "	—	—	—	1st Floor	15	407
Couvre Porte	"	" A. Borg	24	12 October	—	—	—	Ground Floor	1	635
Fort Lascaris	"	" A. Alessandri	32	19 "	—	—	—	1st Floor	14	407
"	"	" P. Bonz	32	22 "	—	—	—	2nd Floor	1	598
"	"	" G. Vella	32	26 "	—	—	—	"	14	407
"	"	" G. Menien	21	4 Nov.	—	—	—	"	7	822
Sant' Elena	"	" S. Cortis	46	13 "	—	—	—	Ground Floor	—	500

from Diarrhœa and Cholera among Troops at Malta, during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
	From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Sufficient	1	—	1	—	Aqueduct & rain water.	Sufficient	Good	2 months	Bad	—
Insufficient	—	—	—	—	"	"	"	"	Good	—
Sufficient	1	—	1	—	"	"	"	"	Bad	—
"	—	—	—	—	"	"	"	6 months	Good	On the lodging list, living at Valetta.
"	—	—	—	—	"	"	"	1 day	"	—
Insufficient	—	—	—	—	"	"	"	"	"	—
Sufficient	—	—	—	—	"	"	"	22 days	"	Hospital orderly.
"	—	—	—	—	"	"	"	2 "	"	—
"	—	—	—	—	"	"	"	3 days	"	—
"	1	—	1	—	"	"	"	"	Bad	—
"	1	—	1	—	"	"	"	4 days	"	—
Insufficient	—	—	—	—	"	"	"	"	Good	—
Sufficient	—	—	—	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	"	"	—
Insufficient	—	—	—	—	"	"	"	"	"	—
Sufficient	—	—	—	—	"	"	"	6 months	"	On the lodging list, living at Valetta.
"	1	—	1	—	"	"	"	6 days	Bad	—
"	—	—	—	—	"	"	"	"	Good	—
"	—	—	—	—	"	"	"	"	"	—
Insufficient	—	—	—	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	7 days	"	—
Sufficient	1	—	1	—	"	"	"	"	Bad	—
"	—	—	—	—	"	"	"	"	Good	—
"	—	—	—	—	"	"	"	"	"	—
"	—	—	—	—	"	"	"	8 days	"	—
"	—	—	—	—	"	"	"	1 month	"	Officer's servant living at Vittoriosa.
"	—	—	—	—	"	"	"	8 days	"	—
Insufficient	—	—	—	—	"	"	"	9 "	"	—
Sufficient	—	—	—	—	"	"	"	10 "	"	—
Insufficient	—	—	—	—	"	"	"	10 "	"	—
Sufficient	—	—	—	—	"	"	"	10 "	"	—
"	—	—	—	—	"	"	"	10 "	"	—
"	—	—	—	—	"	"	"	4 months	"	On the lodging list, Florians.
"	—	—	—	—	"	"	"	13 days	"	—
Insufficient	—	—	—	—	"	"	"	14 "	"	—
Sufficient	—	—	—	—	"	"	"	16 "	"	—
"	—	—	—	—	"	"	"	16 "	"	—
"	—	—	—	—	"	"	"	17 "	"	—
"	—	—	—	—	"	"	"	17 "	"	—
"	—	—	—	—	"	"	"	22 "	"	—
"	—	—	—	—	"	"	"	23 "	"	—
"	1	—	1	—	"	"	"	24 "	Bad	—
Insufficient	—	—	—	—	"	"	"	29 "	"	—
Sufficient	—	—	—	—	"	"	"	42 "	"	—
Insufficient	—	—	—	—	"	"	"	49 "	"	—
Sufficient	—	—	—	—	"	"	"	52 "	"	—
Insufficient	—	—	—	—	"	"	"	56 "	"	—
Sufficient	—	—	—	—	"	"	"	65 "	"	—
"	1	—	1	—	"	"	"	74 "	"	—

F. BERNARD, M.D., Surgeon, R. M. F. Artillery.

TABLE XXII.—Showing the SANITARY CONDITION of AFFECTED QUARTERS, together with CASES and DEATHS

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Inmate in Room at the Time of Attack.
Where quartered.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
Plague Hospital	Royal Artillery	Mrs. Monger	Yrs. 21	—	—	22 June	23 June	Ground Floor	—	—
" "	"	Mrs. Tom	33	—	—	23 "	27 "	"	—	—
Barrack at Salvatore Counterguard.	"	Mrs. Perry	27	—	—	1 July	2 July	"	—	—
" "	"	Mrs. McIlroy	28	—	—	1 "	Recovered	"	—	—
" "	"	Mrs. Grey	36	—	—	1 "	"	"	—	—
" "	"	Mrs. Troy	29	—	—	1 "	"	"	—	—
" "	"	Mrs. Forrester	32	—	—	1 "	"	"	—	—
" "	"	Mrs. Knight	28	—	—	1 "	"	"	—	—
Quarters at Salvatore Counterguard.	"	Mrs. Phipps	25	—	—	2 "	8 July	"	—	—
Salvatore Counterguard.	"	Mrs. Gadd	29	—	—	9 "	10 "	"	—	—
St. James Cavalier	"	Mrs. Forrester	32	16 July	Recovered	—	—	"	—	—
" "	"	Mrs. Morgan	29	—	—	26 July	Recovered	"	—	—
Upper St. Elmo	"	Mrs. O'Brien	28	9 August	Recovered	—	—	"	—	—
" "	"	Mrs. Campbell	42	18 "	—	21 August	Recovered	"	—	—
Plague Hospital	"	Amelia Martha Tom	9 8/12	—	—	20 June	21 June	"	—	—
" "	"	Joseph Wm. Monger	8/12	26 June	27 June	—	—	"	—	—
" "	"	Henry Geo. Marshallsey.	6½	—	—	29 June	30 June	"	—	—
Quarters at Salvatore Counterguard.	"	Jemima Phipps	1 4/12	—	—	6 July	6 July	"	—	—
Tents at Salvatore Counterguard.	"	Joseph Wm. Cragg	4/12	6 July	Recovered	—	—	"	—	—
" "	"	Elizabeth Whitfield	3	—	—	6 July	Recovered	"	—	—
" "	"	Henry Perry	8	—	—	6 "	"	"	—	—
" "	"	Maria Troy	4	10 July	Recovered	—	—	"	—	—
" "	"	Mary Jane Wheller	2½	—	—	11 July	Recovered	"	—	—
Marsamuscetto	"	Ellen Harmer	4	—	—	5 August	5 August	1st Floor	—	—
Sleima	"	Edw. Wm. Lawson	1½	25 August	31 August	—	—	Ground Floor	—	—
St. James Cavalier	"	Emily Gadd	7/12	16 July	20 July	—	—	"	—	—
Lower St. Elmo	100th Regiment	Mrs. Waight	21	21 July	R. 30 July	—	—	Ground Floor	3	Married
Crown Works	"	Mrs. Shea	35	23 "	R. 31 "	—	—	"	18	"
"	"	Mrs. Jones	32	—	—	27 July	29 July	"	5	"
Horn Works	"	Mrs. Moser	32	—	—	28 "	"	"	6	"
"	"	Mrs. Bates	29	30 July	R. 4 Aug.	—	—	"	6	"
Crown Works	"	Mrs. Welsh	40	31 "	R. 5 "	—	—	"	12	"
Horn Works	"	Mrs. Reardon	36	1 August	R. 10 "	—	—	"	5	"
Pembroke Camp	"	Mrs. Ridley	28	—	—	27 August	27 Aug.	"	Unknown	"
Sliema	"	Mrs. Munns	25	—	—	1 Sept.	R. 11 Sept.	"	"	Unknown.
Horn Works	"	Mrs. Grodan	29	3 October	R. 9 Oct.	—	—	"	1	Married
Lower St. Elmo	"	Mrs. Casey	21	24 "	R. 29 "	—	—	1st Floor	6	"
Horn Works	"	Child, E. Cadden	1	5 August	R. 20 Aug.	—	—	Ground Floor	4	Married quarters.
Garrison Hospital	"	" M. E. Edwards	2	23 "	R. 1 Jan. 1866	—	—	"	Hosptl. sjts. qy. No. 10.	"
Sliema	"	" M. F. Brady	5	—	—	29 August	R. 4 Sept.	1st Floor	Unknown.	Unknown.
Lower St. Elmo	"	" Rebecca Ridley	1	21 Sept.	25 October	—	—	Ground Floor	6	Married quarters.
"	"	" Phoebe Ridley	3	—	—	25 October	R. 31 Oct.	"	6	"
"	"	" "	"	31 October	R. 12 Nov.	—	—	"	6	"

from DIARRHŒA and CHOLERA among SOLDIERS' WIVES and CHILDREN, in MALTA during the Epidemic of 1865.

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	REMARKS.
	From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Sufficient	Drains	Latrines	Filthy sea-shore.	—	Rain-water tank.	Sufficient	Good	—	Bad	Near the ill-drained Lazaretto.
"	"	"	"	—	"	"	"	—	"	" "
Insufficient	No	No	No	—	Aqueduct	"	"	2 months	Good	A very narrow place. Confined area.
"	"	"	"	—	"	"	"	"	"	" "
"	"	"	"	—	"	"	"	"	"	" "
"	"	"	"	—	"	"	"	"	"	" "
"	"	"	"	—	"	"	"	"	"	" "
"	"	"	"	—	"	"	"	"	"	" "
"	"	"	"	—	"	"	"	"	"	" "
"	"	"	"	—	"	"	"	"	"	" "
"	Drains	Latrines	Yes	Yes*	Tank of rain-water.	"	Tasted badly.	"	Indifferent	* Overflow of sewerage into the ditch near to the barrack.
"	"	"	"	"	"	"	"	"	"	Surrounded by dirty neighbourhood.
Sufficient	No	No	No	No	Tanks	"	Good	3 months	"	" "
"	"	"	"	"	"	"	"	"	"	" "
"	Drains	Latrines	Filthy sea-shore.	"	Tank	"	"	—	Bad	Near Lazaretto.
"	"	"	"	"	"	"	"	—	"	" "
"	"	"	"	"	"	"	"	—	"	" "
Insufficient	No	No	No	"	Aqueduct	"	"	2 months	Good	A very narrow place.
Sufficient	"	"	"	"	"	"	"	—	"	Tents occupied by those who had been first at Plague Hospital, afterwards at Salvatore Counterguard.
"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	—	"	
"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	—	"	—
"	"	"	"	"	"	"	"	3 months	Indifferent	Near the ill-drained Manderaggio.
—	—	—	—	—	—	—	—	—	—	—
Insufficient	Drains	Latrines	Yes	A filthy ditch.	Tank	Sufficient	Tasted badly.	2 months	Bad	—

THOMAS PARK, SURGEON, 3RD BATTALION ROYAL ARTILLERY.

Insufficient	Yes, frequently from the old main drain.	None	From opening of city sewers.	From officers' stables.	Aqueduct	Sufficient	Good and clear.	March *	Bad	* Previous to regiment marching into Lower St. Elmo on 24th March 1865, and frequently since.
Sufficient	No	"	No	No	"	"	"	20 June	Good	as high as the iron racks, and round the base of the walls on the floors.
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
—	—	—	—	Unknown	—	—	—	—	—	—
—	—	—	—	Unknown	—	—	—	—	—	In lodgings, via Kzira, Sliema.
Sufficient	No	No	No	No	Aqueduct	Sufficient	Good and clear.	20 June	Good	—
Insufficient	Yes, frequently from the old main drain.	"	From opening of city sewers.	From officers' stables.	"	"	"	August	Bad	—
Sufficient	No	"	No	No	"	"	"	20 June	Good	—
"	"	"	"	"	"	"	"	May	Bad	—
—	—	—	—	Unknown	—	—	—	—	—	In lodgings, via Kzira, Sliema.
Insufficient	Yes, frequently from the old main drain.	No	From opening of city sewers.	From officers' stables.	Aqueduct	Sufficient	Good and clear.	August	Bad	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—

J. SMITH CHARTERS, SURGEON, 100TH P. W. R. C

TABLE XXII.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths from

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Inmate in Room at the Time of Attack.
Where quartered.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
			Yrs.							
Plague Hospital	2nd Battalion 8th Regiment.	Mrs. Driall	20	1 July 1865	—	—	—	Ground Floor	Not known.	600
Fort Manoel	„	John Hampson	½	5 „	—	—	—	„	4	1,200
Pembroke Camp	„	Margaret Flynn	4	15 „	19 July 1865	—	—	Wooden hut	—	About 700.
„	„	Mrs. Flynn	36	—	—	20 July	28 July	„	—	„
„	„	John Flynn	1½	—	—	24 „	29 „	„	—	„
Fort Manoel	„	Mrs. Cousens	26	28 July	—	—	—	1st Floor	3	2,000
Pembroke Camp	„	Johanna Curtin	6	—	—	29 July	29 July	Wooden hut	—	About 700.
„	„	Julia Flannery	8	—	—	30 „	31 „	„	—	„
Fort Manoel	„	Mrs. Harris	25	31 July	—	—	—	Ground Floor	Lodgings	Not known.
Strada Mercanti	„	Mrs. Brook	30	—	—	12 Aug.	13 Aug.	4th Floor	„	„
„	„	Louisa Brook	8	—	—	13 „	14 „	„	„	„
„	„	Frederick Brook	6	—	—	13 „	—	„	„	„
„	„	William Brook	4	—	—	13 „	16 Aug.	„	„	„
Pembroke Camp	„	William Hooke	½	27 August	30 August	—	—	Wooden hut	—	About 700.
„	„	Mrs. Fitzgerald	29	—	—	22 Sept.	—	2nd Floor	29	2,000
Left Horn Work	2nd Battalion 4th Regiment.	Mrs. Thowburne	33	—	—	13 July	14 July	Ground Floor	Hut 11	1,560
„	„	Mrs. May	61	—	—	22 „	22 „	„	„ 17	940
„	„	Mrs. Bailey	35	—	—	24 „	Recovered	„	„ 24	1,340
„	„	Mrs. Walker	23	—	—	24 „	„	„	„ 20	940
„	„	Mrs. Carton	33	—	—	26 „	26 July	„	„ 16	1,340
Notre Dame Ravelin	„	Mrs. Gimber	29	—	—	28 „	28 „	„	„ 4	1,560
Left Horn Work	„	Mrs. Hazeley	29	—	—	29 „	1 August	„	„ 19	1,340
„	„	Mrs. Flatters	25	29 July	Recovered	—	—	„	„ 8	2,350
„	„	Mrs. Miller	33	29 „	„	—	—	„	„ 18	2,350
„	„	Mrs. Denman	30	29 „	„	—	—	„	„ 3	1,560
Encampment	„	Mrs. Crombie	29	—	—	2 August	3 August	„	Tent	205
Schoolmaster's Quarters, Floriana.	„	Mrs. Green	24	12 Aug.	Recovered	—	—	„	Quarters	1,033
		CHILDREN.								
Left Horn Work	„	Child D. Barnes	2	1 July	20 July	—	—	Ground Floor	Hut 2	600
„	„	Child J. Barnes	4	24 „	Recovered	—	—	„	„ 2	600
Notre Dame Ravelin	„	Child E. Crombie	2	24 „	27 August	—	—	„	„ 5	670
Left Horn Work	„	Child Har. S. Duck	4	24 „	Recovered	—	—	„	„ 14	1,560
Notre Dame Ravelin	„	Child Wm. Gimber	1½	25 „	3 August	—	—	„	„ 4	670
Left Horn Works	„	Child C. W. Hazeley	2½	28 „	1 „	—	—	„	„ 19	670
Encampment	„	Child G. C. Hazeley	1	—	—	2 August	5 August	„	Tent	530
„	„	Mrs. Lawler's Child	6	10 Sept.	Recovered	—	—	„	„	—
„	„	Mrs. Barnes' Child	4	10 „	„	—	—	„	„	171
Married Quarters, Polverista.	84th Regiment	Mrs. Hickmott	28	—	—	4 Aug. 1865	5 Aug. 1865	2nd Floor	46	1,026
Zeitun Gate	„	Mrs. McNulty	22	—	—	5 „	9 „	Ground Floor	—	—
Married Quarters, Polverista.	„	Mrs. Jolly	24	—	—	16 „	30 „	2nd Floor	33	1,539
„	„	Mrs. Nowland	19	16 Aug. 1865	Recovered	—	—	1st Floor	19	980
„	„	Mrs. Boulger	27	16 „	„	—	—	Ground Floor	8	1,404

Diarrhœa and Cholera among Soldiers' Wives and Children, in Malta during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
	From "Drains" or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Insufficient	From drains	None	None	None	Tanks	Sufficient	Good	Not known	Indifferent	—
Sufficient	None	"	"	"	"	"	"	2 months	Good	—
"	"	Occasionally	An uncovered rear in the neighbourhood.	No	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	None	None	"	"	"	"	"	"	—
"	"	Occasionally	An uncovered rear in the neighbourhood.	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	None	None	House close to water edge.	"	"	"	Not known	"	—
Insufficient	From drains	"	"	None	"	Insufficient	Bad taste	About 8 months.	Bad	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	Recovered.
"	"	"	"	"	"	"	"	"		—
Sufficient	"	Occasionally	An uncovered rear in the neighbourhood.	"	"	Sufficient	Good	2 months	"	—
	"	"	"	"	"	"	"	3 months	"	Recovered

JOHN MADDEN, Surgeon, 2nd Battalion, 8th (The King's) Regiment.

Sufficient	None	None	None	None	Aqueduct	Sufficient	Good	1 month	Good	—
"	"	"	"	"	"	"	"	39 days	"	—
"	"	"	"	"	"	"	"	1 month	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	6 weeks	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	Tent	"	—
"	"	"	"	"	"	"	"	78 days	"	—
Sufficient	None	None	None	None	Aqueduct	Sufficient	Good	16 days	Good	—
"	"	"	"	"	"	"	"	6 weeks	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	Tent	"	—
"	"	"	"	"	"	"	"	"	"	—
"	"	"	"	"	"	"	"	"	"	—

B. Lane, Surgeon, 2nd Battalion, 4th Regiment, King's Own Royals.

Sufficient	No	No	No	Habit of throwing slops on ground in front of quarters.	Rain water	Sufficient	Good	White-washed in August 1865.	Good	—
Insufficient	"	Yes	"		"	"	"	—	—	Not on the strength.
Sufficient	"	No	"		"	"	"	White-washed in August 1865.	Good	—
"	"	"	"		"	"	"		"	—
"	"	"	"		"	"	"		"	—

TABLE XXII.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths from

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Inmate in Room at the Time of Attack.
Where quartered.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
Married Quarters, Polverista.	84th Regiment	Mrs. Swift	Yrs. 24	18 Aug. 1865	Recovered	—	—	Ground Floor	6	702
Fort Verdala	„	Mrs. Driver	28	19 „	„	—	—	„	4	1,630
Married Quarters, Polverista.	„	Mrs. Harney	28	19 „	„	—	—	2nd Floor	39	615
„	„	Mrs. Bailey	29	22 „	„	—	—	Ground Floor	1	1,404
„	„	Mrs. Kets Remety	34	25 „	„	—	—	2nd Floor	36	1,026
„	„	Mrs. Austwick	34	28 „	„	—	—	„	43	615
Fort Verdala	„	Mrs. Harrison	30	—	—	29 Aug. 1865	1 Sept. 1865	Ground Floor	1	815
Married Quarters, Polverista.	„	Mrs. Nowland	19	1 Sept. 1865	Recovered	—	—	1st Floor	19	980
„	„	Mrs. Sweeney	20	1 „	„	—	—	„	30	1,470
Fort Verdala	„	Mrs. Robinson	18	1 „	„	—	—	Ground Floor	7	1,630
Married Quarters, Polverista.	„	Mrs. Jenkinson	30	10 „	„	—	—	1st Floor	24	1,470
„	„	Mrs. Birch	28	13 „	„	—	—	„	27	980
„	„	Mrs. Bould	27	13 „	„	—	—	Ground Floor	25	936
Zabbar Gate	„	Mrs. Clarney	24	18 „	„	—	—	„	—	—
Married Quarters, Polverista.	„	Mrs. Sullivan	33	25 „	„	—	—	2nd Floor	33	769
„	„	Mrs. Stretch	26	3 Oct.	„	—	—	Ground Floor	16	1,404
„	„	Mrs. O'Brien	28	14 „	„	—	—	2nd Floor	48	1,539
Married Quarters, Polverista.	„	Child, Hickmott	1	1 Aug.	„	—	—	1st Floor	3	1,026
Zeitun Gate	„	„ McNulty	3	—	—	7 Aug. 1865	9 Aug. 1865	Ground Floor	—	—
Married Quarters, Polverista.	„	„ Harney	2	8 Aug. 1865	17 Sept. 1865	—	—	2nd Floor	39	615
„	„	„ Marriott	1	15 „	27 Oct.	—	—	1st Floor	26	730
„	„	„ Nowland	1	16 „	14 „	—	—	„	19	980
„	„	„ Quarmby	42 days.	17 „	27 Aug.	—	—	2nd Floor	40	1,026
„	„	„ Minahan	90 days.	17 „	20 „	—	—	„	46	1,026
Upper Vittoriosa Hospital.	„	„ Jones (Emma)	4	17 „	Recovered	—	—	1st Floor	8	1,571
„	„	„ Jones (Annie)	2	17 „	„	—	—	„	8	1,571
Zeitun Gate	„	„ Lawler	2	—	—	10 Aug. 1865	14 Aug. 1865	„	Officers' quarters.	—
Notre Dame Bastion	„	„ Blake	1	18 Aug. 1865	9 Oct. 1865	—	—	Ground Floor	3	1,000
Married Quarters, Polverista	„	„ Rowbottom	1	20 „	Recovered	—	—	1st Floor	29	588
Fort Verdala	„	„ Lawson	2	24 „	„	—	—	Ground Floor	2	1,630
Married Quarters, Polverista.	„	„ Greaves	12	25 „	„	—	—	„	7	468
„	„	„ Kelly	1	26 „	„	—	—	1st Floor	25	735
Fort Verdala	„	„ Farrell	2	28 „	„	—	—	Ground Floor	7	1,680
„	„	„ Fitzgerald	2	29 „	„	—	—	„	31	1,630
Married Quarters, Polverista.	„	„ Dempsey	4	—	—	29 Aug. 1865	31 Aug. 1865	2nd Floor	45	1,026
„	„	„ Austwick	2	1 Sept. 1865	Recovered	—	—	„	43	615
„	„	„ Taylor	1	4 „	„	—	—	Ground Floor	14	936
„	„	„ Broderick	1	11 „	26 Oct. 1865	—	—	2nd Floor	38	615
Fort Verdala	„	„ Harrison (younger).	2	13 „	Recovered	—	—	Ground Floor	1	830
„	„	„ Dawson	213 days.	22 „	„	—	—	„	30	1,630
„	„	„ Harrison (elder).	7	22 „	4 Oct. 1865	—	—	„	1	830
Married Quarters, Polverista.	„	„ Whelehan	4	23 „	Recovered	—	—	„	12	936
„	„	„ Mahoney	61 days.	25 „	19 Oct. 1865	—	—	2nd Floor	41	615
„	„	„ Davis	3	27 „	Recovered	—	—	1st Floor	27	588
Zabbar Gate	„	„ Connell	7	27 „	27 Oct. 1865	—	—	Ground Floor	—	—
Married Quarters, Polverista.	„	„ Kelly	3	28 „	Recovered	—	—	1st Floor	25	735
Fort Verdala	„	„ Fitzgerald	2	30 „	„	—	—	Ground Floor	31	1,630
„	„	„ Farrell	2	7 Oct. „	„	—	—	„	7	1,630
„	„	„ Harrison	7	7 „	„	—	—	„	1	830
Notre Dame Bastion	„	„ Blake	4	10 „	16 Oct. 1865	—	—	„	3	1,000
New Married Quarters.	„	„ Morley	63 days.	10 „	15 „	—	—	„	15	561

Diarrhœa and Cholera, among Soldiers' Wives and Children in Malta during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
	From "Drains" or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Sufficient	No	No	No	Habit of throwing slops on ground in front of quarters.	Rainwater	Sufficient	Good	Whitewashed in August 1865.	Good	
Insufficient	,,	,,	,,		,,	,,	,,		,,	
Sufficient	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
Insufficient	,,	,,	,,		,,	,,	,,		,,	
Sufficient	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
Insufficient	,,	,,	,,		,,	,,	,,		,,	
Sufficient	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
—	—	—	—		,,	—	—		—	Not on the strength.
Sufficient	No	No	No		,,	Sufficient	Good	Whitewashed in August 1865.	Good	
,,	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	—	—		,,	
Insufficient	,,	Yes	,,		,,	Sufficient	Good	Unknown	—	Not on the strength.
Sufficient	,,	No	,,		,,	,,	,,	Whitewashed in August 1865.	Good	
,,	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
Insufficient	Yes	Yes	Yes	Yes	,,	,,	,,		Bad	
,,	,,	,,	,,	,,	,,	,,	,,		,,	
,,	No	,,	No	No	,,	,,	,,	Unknown	Good	
,,	,,	No	,,	Habit of throwing slops on ground in front of quarters.	,,	,,	,,	,,	,,	
Sufficient	,,	,,	,,		,,	,,	,,	Whitewashed in August in 1865.	,,	
Insufficient	,,	,,	,,		,,	,,	,,		,,	
Sufficient	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
Insufficient	,,	,,	,,		,,	,,	,,		,,	
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Sufficient	,,	,,	,,		,,	,,	,,		,,	
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Insufficient	,,	,,	,,		,,	,,	,,		,,	
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Sufficient	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
—	—	—	—		,,	—	—		—	Not on the strength.
Sufficient	No	No	No		,,	Sufficient	Good	Whitewashed in August 1865.	Good	
Insufficient	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,		,,	
,,	,,	,,	,,		,,	,,	,,	Unknown	,,	
Sufficient	,,	,,	,,		,,	,,	,,	White-washed in August 1865.	,,	

P. J. CLARKE, Surgeon, 84th

TABLE XXII.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths from

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked; "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Inmate in Room at the Time of Attack.
Where quartered.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
Fort Ricasoli	29th Regiment	Child, J. Rostron	Yrs. 1	15 July	12 August	—	—	Ground Floor	55	790
Pembroke Camp	„	Mrs. M. A. Jarvis	33	—	—	26 July 1865	31 July 1865	„	6	1,176
Vittoriosa	„	Child, S. Walters	2	1 August	5 August	—	—	„	10	910
Fort Ricasoli	„	„ Kennelly	1	5 „	—	—	—	„	51	790
„	„	Mrs. Westcott	22	6 „	—	—	—	„	47	620
„	„	Child, A. Colgan	3	7 „	—	—	—	„	49	620
„	„	Mrs. Indoa	36	8 „	—	—	—	„	35	469
Cottonera	„	Child, H. Nicholls	1	10 „	14 August	—	—	1st Floor	2	54
„	„	„ S. Mason	2	11 „	12 „	—	—	„	2	54
Fort Ricasoli	„	„ C. Mitchell	3	12 „	15 „	—	—	Ground Floor	52	508
„	„	Mrs. A. Murray	22	—	—	14 August	14 August	„	45	760
Cottonera	„	„ C. Bourke	21	—	—	14 „	16 „	1st Floor	2	54
Fort Ricasoli	„	„ M. McHugh	28	—	—	15 „	17 „	Ground Floor	57	508
Cottonera	„	„ V. Mason	24	—	—	16 „	16 „	1st Floor	1	54
Fort Ricasoli	„	Child, F. Todd	8	—	—	18 „	20 „	Ground Floor	Hut 5	960
„	„	„ M. Warren	1	18 August	20 August	—	—	„	„	960
„	„	Mrs. C. Hickie	27	18 „	—	—	—	„	56	559
„	„	Child, M. Halloran	2	19 „	—	—	—	„	58	559
„	„	„ M. McEvoy	11	19 „	—	—	—	„	49	508
„	„	Mrs. M. Colgan	30	20 „	—	—	—	„	49	469
„	„	Child, H. Mitchell	1	20 „	—	—	—	„	52	508
„	„	„ Bray	2	21 „	—	—	—	„	47	620
„	„	„ Halloran	2	22 „	—	—	—	„	58	559
Pembroke Camp	„	„ J. McHugh	1	—	—	22 August	22 August	„	Hut 3	960
„	„	„ A. Douglass	1	22 August	22 August	—	—	„	14	538
Fort Ricasoli	„	Mrs. Wilkinson	24	—	—	25 August	25 August	„	58	559
„	„	Child, Wilkinson	2	26 August	—	—	—	„	58	559
„	„	„ C. Hickie	1	31 „	—	—	—	„	56	559
„	„	„ D. Wilkinson	1	31 „	15 Sept.	—	—	„	Hut 5	960
„	„	„ A. Colgan	3	4 Sept.	—	—	—	„	66	620
„	„	„ E. Westcott	1	16 „	—	—	—	„	49	620
Pembroke Camp	„	„ M. McMain	1	16 „	21 Sept.	—	—	„	5	538
Fort Ricasoli	„	„ E. Bray	2	17 „	—	—	—	„	47	620
„	„	„ J. Reddington	1	18 „	—	—	—		48	620
„	„	Mrs. McGovern	24	24 „	—	—	—	„	48	620
„	„	„ Hickie	27	25 „	—	—	—	„	56	559
„	„	Child, Westcott	2	14 October	—	—	—	„	47	620
„	„	„ Goggins	4	18 „	—	—	—	„	49	52
„	„	„ H. McEvoy	2	18 „	—	—	—	„	49	500
„	„	„ J. O'Donnell	5	18 „	22 October	—	—	„	28	313
„	„	Mrs. A. Reddington	24	—	—	23 October	23 October	„	48	620
„	„	Child, A. O'Brien	10	—	—	26 „	27 „	„	57	508
„	„	„ E. Stokes	1	26 October	31 October	—	—	„	57	508
„	„	Mrs. Horan	18	26 „	—	—	—	„	39	313
„	„	Child, M. Smith	1	27 „	2 Nov.	—	—	„	27	313
„	„	Mrs. Stokes	24	—	—	29 October	30 October	„	57	508
„	„	Child, C. Hickie	1	31 October	—	—	—	„	56	600
„	„	„ M. McEvoy	11	—	—	1 Nov.	1 Nov.	„	49	500
„	„	„ John McInerny	10	1 Nov.	—	—	—	„	50	790
„	„	„ J. McEvoy	2	1 „	—	—	—	„	49	500
„	„	„ E. Jones	2	1 „	18 Nov.	—	—	„	57	790
„	„	Mrs. McGovern	26	10 „	—	—	—	„	47	790
„	„	„ Jones	40	—	—	12 Nov.	13 Nov.	„	Tent	97

Diarrhœa and Cholera among Soldiers' Wives and Children, in Malta during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
	From "Drains" or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient" or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Very insufficient.	No	No	No	No	Rain-water from wells.	Sufficient	Good	5 months	Good	—
Sufficient	„	„	„	„	„	„	„	5 „	„	—
Insufficient	Yes	Yes	Yes	Yes	„	„	„	2 weeks	Bad	—
„	No	No	No	No	„	„	„	5 months	Good	—
„	„	„	„	„	„	„	„	5 „	„	—
„	„	„	„	„	„	„	„	5 „	„	—
„	„	„	„	„	„	„	„	5 „	„	—
„	„	„	„	„	„	„	„	2 „	Bad	Lodgings at "A Gun Inn."
„	„	„	„	„	„	„	„	2 „	„	„ „
„	„	„	„	„	„	„	„	6 „	Good	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	2 „	Bad	Lodgings at "A Gun Inn."
„	„	„	„	„	„	„	„	6 „	Good	—
„	„	„	„	„	„	„	„	2 „	Bad	Lodgings at "A Gun Inn."
Sufficient	„	„	„	„	„	„	„	6 „	Good	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
Insufficient	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
Sufficient	„	„	„	„	„	„	„	1 „	„	—
„	„	„	„	„	„	„	„	1 „	„	—
Insufficient	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
Sufficient	„	„	„	„	„	„	„	6 weeks	„	—
Insufficient	„	„	„	„	„	„	„	2 „	„	—
„	„	„	„	„	„	„	„	2 „	„	—
„	„	„	„	„	„	„	„	3 „	„	—
„	„	„	„	„	„	„	„	3 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	6 „	„	—
„	„	„	„	„	„	„	„	7 „	„	—
„	„	„	„	„	„	„	„	7 „	„	—
„	„	„	„	„	„	„	„	8 „	„	—
„	„	„	„	„	„	„	„	8 „	„	—
„	„	„	„	„	„	„	„	8 „	„	—
„	„	„	„	„	„	„	„	8 „	„	—
„	„	„	„	„	„	„	„	9 „	„	—
„	„	„	„	„	„	„	„	9 „	„	—
„	„	„	„	„	„	„	„	9 „	„	—
„	„	„	„	„	„	„	„	9 „	„	—
„	„	„	„	„	„	„	„	11 „	„	—
„	„	„	„	„	„	„	„	11 „	„	—

E. MOORHEAD, Surgeon-Major, 29th

TABLE XXII.—Showing the Sanitary Condition of Affected Quarters, together with Cases and Deaths from

Occupation when the Epidemic appeared.		Name of Patient.	Age.	Diarrhœa.		Cholera.		Floor where attacked: "Ground Floor," "1st Floor," or "2nd Floor."	Number of Room where attacked.	Cubic Feet per Inmate in Room at the Time of Attack.
Where quartered.	Corps.			Date of Attack.	Date of Death.	Date of Attack.	Date of Death.			
St. Nicholas Bastion	1st Battalion 22nd Regiment	Mrs. Booth	Yrs. 28	—	—	9 August	9 August	Ground Floor	62	468
Burmola Curtain	„	Child, C. Larkin	1 5/12	9 August	Recovered	—	—	„	10	958
Servants' Room, Inquisitors Palace	„	Mrs. Donohue	26	11 „	„	—	—	„	7	1,080
St. Frances Floriana	„	Mrs. Finucane	28	—	—	12 August	12 August	„	Provost Sergeant's Room.	2,880
St. John's Curtain	„	Child, C. Sitton	1 5/12	—	—	12 „	13 „	„	207	294
„	„	Boy, Wm. Sitton	7	—	—	14 „	15 „	„	207	294
„	„	Mrs. O'Brien	26	28 August	Recovered	—	—	„	176	235
„	„	Boy, Wm. Harbury	4	29 „	„	—	—	„	201	393
Burmola Curtain	„	Mrs. Humphries	38	14 Sept.	„	—	—	1st Floor	3	2,016
	„	Child, T. Parlin	2	19 „	„	—	—	Ground Floor	13	1,008
	„	Mrs. Sullivan	28	—	—	22 Sept.	24 Sept.	1st Floor	11	1,344
„	„	Mrs. Brookman	28	—	—	26 „	30 „	„	4	864
„	„	Mrs. McAuliffe	26	—	—	26 „	Recovered	Ground Floor	1	1,008
St. Francesco di Poalo.	„	Mrs. Mayner	22	28 Sept.	Recovered	—	—	1st Floor	Provost Sergeant's Room.	1,785
St. John's Curtain	„	Mrs. Ross	30	25 October	„	—	—	Ground Floor	199	294
„	„	Child, J. A. Ross	1 4/12	26 „	„	—	—	„	199	294
Room over the Gateway at Notabile.	Army Hospital Corps	Mary Ann Bishop	25	—	—	3 a.m. 6 August.	10.15 p.m. 6 August.	1st Floor	—	400
The Tower at Notabile	„	Mary Jane Mahony	2	—	—	9.30 a.m. 11 August.	Recovered	2nd Floor	—	500

and Cholera among Soldiers' Wives and Children in Malta during the Epidemic of 1865—*continued.*

State of Ventilation: "Sufficient," "Insufficient."	Any Nuisance experienced at the Time of Attack.				Water Supply at the Time of Attack.			How long before the Attack had the affected Room been Lime-washed.	General Sanitary Condition of Neighbourhood of Quarter: "Good," "Indifferent," "Bad."	Remarks.
	From "Drains," or "Gulleys."	From "Latrines."	From "Filthy Neighbourhood."	From other Sources.	Whence derived.	Quantity: "Sufficient," or "Insufficient."	Quality: "Good," "Clear," "Muddy," "Tasted badly."			
Sufficient	—	1	—	—	Aqueduct & Rain Water.	Sufficient	Good	3 months	Good	—
„	—	—	1	—	„	„	„	1 month	Bad	—
„	—	—	—	—	„	„	„	3 months	„	—
„	—	—	—	—	„	„	„	„	Good	—
Insufficient	—	—	—	—	„	„	„	„	„	—
„	—	—	—	—	„	„	„	„	„	—
„	—	—	—	—	„	„	„	„	„	—
„	—	—	—	—	„	„	„	„	„	—
Sufficient	—	—	1	—	„	„	„	2 months	Bad	—
„	—	—	1	—	„	„	„	„	„	—
„	—	—	1	—	„	„	„	„	„	—
„	—	—	1	—	„	„	„	„	„	—
Insufficient	—	—	1	—	„	„	„	„	„	—
„	—	—	1	—	„	„	„	4 months	„	—
„	—	—	—	—	„	„	„	1 month	Good	—
„	—	—	—	—	„	„	„	„	„	—

A. L. ADAMS, Surgeon, 1st Battalion, 22nd Regiment.

Sufficient	—	—	—	Vide Remarks.	Tank in Sanitarium.	Sufficient	Good	4 months.	Vide Remarks.	Mrs. Bishop lived in the isolated room over the gateway, and hardly ever left it. She abstained from all intercourse with people from Rabbato, &c. The cesspit of the Sanitarium was periodically discharged into a garden about 200 yards from these quarters. It was discharged on the night on which Private Mahony's child was attacked.
„	—	—	—	„	„	„	„	„	„	

THOMAS BLATHERWICK, Staff Surgeon.

No. XXIII.

Commanding Royal Engineer's Office, Malta, April 9, 1867.

LIST of SAMPLES of WATER (in duplicate) which have been packed, and transmitted to the Superintendent of Stores, to be forwarded to Woolwich for analysis.

No. 1.—Specimen taken at the point, where all the sources proceeding from Bingemma, &c. meet near Casal Attard, and there enter the Wignancourt Aqueduct.

No. 2.—Specimen from the distribution tank at Porta Reale.

No. 3.—Specimen from the well or tank from which the water for the Plague Hospital was derived before cholera appeared in 1865.

No. 4.—Specimen from distribution tank of the Fauara Aqueduct, at Zeitun Gate.

No. 5.—Specimen from the water raised by the Government engine at the Marsa, in the Farm of Armier.

No. 6.—Specimen of the water supplied by the aqueduct to Rabato in Gozo.

(Signed) EDWARD W. DURNFORD, Col.,
Com. Royal Engineer.

Chemical Department, Royal Arsenal,
Woolwich, June 19, 1867.

Memorandum for the Director of Works, &c. with reference to the results of analysis of samples of water (as per accompanying list) received from the Commanding Royal Engineer, Malta.

The results of analysis of these waters were as follow :—

	In grains per Imperial gallon.		
	No. 1.	No. 2.	No 3.
Total solid constituents (by direct determination)	25·49	24·38	15·85
Carbonate of lime	11·20	10·50	8·70
Nitrate of lime	0·55	0·45	—
Carbonate of magnesia	2·12	2·12	1·06
Sulphate of soda	2·13	1·95	0·85
Chloride of sodium	9·34	8·81	4·14
Ammonia	Minute trace.	—	—
Organic and other volatile matters	0·00	0·20	0·40

	In grains per Imperial gallon.		
	No. 4.	No. 5.	No. 6.
Total solid constituents	21·10	53·30	42·65
Carbonate of lime	6·80	21·10	10·03
Nitrate of lime	0·51	1·00	0·45
Sulphate of lime	1·63	—	1·46
Carbonate of magnesia	2·80	3·71	6·66
Sulphate of soda	—	3·47	3·89
Chloride of sodium	9·02	23·88	19·96
Ammonia	Trace	—	Trace
Organic and other volatile matters	0·50	0·10	0·20

An inspection of these shows that :—

1. All the waters contain remarkably small proportions of organic and other volatile matters, and nitrates are also present only in small proportions. The waters are therefore perfectly wholesome.

2. Nos. 3 and 4 are moderately soft waters and very well suited for all domestic purposes.

3. Nos. 1, 2, and 6 are notably harder than Nos. 3 and 4, but they are rendered soft by boiling.

4. No. 5 water is very hard (though rendered soft by boiling), and contains a somewhat considerable proportion of common salt; this water is therefore inferior to all the others, though the last named impurity can scarcely be considered to amount to an injurious proportion.

(Signed) F. A. ABEL,
Chemist of the War Department.

No. XXIV.

PROVISIONS relating to the PUBLIC HEALTH contained in the "LAWS and REGULATIONS of POLICE for the ISLAND of MALTA and its DEPENDENCIES."

The following acts and omissions are prohibited:

1. To throw or to let fall any dirt, rags, or other matters in a street or over a street, or to let offensive or stinking materials flow towards a street; or to transport such materials through a street otherwise than in vehicles or by other covered means; or to beat or shake dust from carpets, or mats, or other objects in a street or over a street, except by permission of the police; or to void urine in any street of the cities of Valetta, Cospicua, Senglea, and Vittoriosa, or of the suburb called Floriana, except in the places appointed for that purpose; or to deposit or leave in a street filth, or rubbish that may have fallen in the conveyance of the same; or to deposit on the wall of any enclosure contiguous to a street stones which ought not to be laid or deposited therein.

51. It is prohibited to construct chimneys, ovens, or forges against a partition wall, although a person's own property, between tenements belonging to different proprietors, or to establish or keep in the neighbourhood of the property of others workshops from which there might be danger of fire, or of explosion, or of noxious exhalations, without a licence from the police, in which shall be specified the distances and works requisite to prevent damage being caused either to a neighbour or to the public health. The differences, however, between the respective proprietors or neighbours on such matters, so far as regards property, shall continue to be cognizable by the Civil Courts.

53. In every house or other building the proprietor shall construct a suitable sink communicating, if it be possible, with the main sewer or with some other outlet according to rule; and every occupier of a house or other building shall reveal to the police the want of such sink.

54. The proprietor of every house or other building is bound to maintain the sink with the requisite drains and coverings, and with a proper grating affixed to the mouth of each drain, in a good state of repair, and shall repair the sink within such reasonable time as shall be fixed in a notice from the police calling on him to do so.

55. Over every cistern, well, or ditch which is intended to be kept open in any house, building, or other place the proprietor shall keep constantly and in good repair a fence at least three palms in height.

56. It is prohibited to leave dirty, corrupt, or stagnant water in underground or other places, whether within houses or elsewhere, so as to produce injury to the public health or annoyance to the neighbourhood; and every person shall take care that, through his negligence, the contents of any sink, or any drain for water or filth, shall not run over or ooze out to the prejudice or annoyance of the occupiers of a contiguous tenement.

57. Whenever it shall be signified or reported to the police that a collection of manure or other noxious or offensive matter exists in any building or other place, to the prejudice of the public health or annoy-

ance of the neighbourhood, the police shall immediately give notice to the proprietor of such manure or other matter, or to the occupier of the place where it may exist, that it must be removed within twenty-four hours after such notice.

58. Whenever any house or other building shall be in such a dirty or unwholesome state as to prejudice the public health, or when the whitewashing, cleaning or purification of any house or other building may tend to prevent any infections, contagious, or epidemic sickness which might occur therein, it shall be lawful for the police to order the proprietor or occupier of such house or other building to whitewash, clean, or purify the tenement in such manner and within such time as may be thought reasonable by the police.

60. No person shall keep slaughter-houses or pigsties in any place or exercise any art or trade which may be prejudicial to the public health or safety or may annoy the neighbours; and no person shall keep in any place merchandise which may produce noxious vapours or odours or which may be prejudicial to the public health or safety.

61. If the annoyance or injury contemplated in the preceding article be not stopped within such period as shall have been prescribed by the Court, the contravaner shall be liable, besides the penalty for the contravention, to a penalty not exceeding two pounds sterling for every day during which such annoyance or injury shall continue unremedied after the expiration of the prescribed period.

64. It is prohibited to burn, boil, distil, or otherwise decompose any root, drug, or other thing in houses, buildings, or other places, causing thereby offensive or dangerous odours or vapours, so as to be prejudicial to the public health or an annoyance to the neighbourhood, without a licence from the police, as prescribed in article 51.

67. No cemetery shall be made at a distance less than two hundred yards from any inhabited house, unless with the consent in writing of the proprietor or of the tenant or other occupier of such house; and although the prescribed distance be observed, yet, if any prejudice to the public health or annoyance to the neighbourhood could result, the distance shall be increased according to the opinion of competent persons.

72. It is prohibited to bury corpses without the permission of the police.

73. It is prohibited to exhume corpses, or to open any tomb before one year shall have elapsed since the burial of a corpse therein, without the permission of the police.

74. Except in cases of absolute necessity, the police shall not issue the permission for the burial of corpses before twenty-four hours shall have elapsed since death took place.

75. It is prohibited to bury corpses in any cemetery situate in any place in which the police shall have prohibited burials, and without making use of those sanitary precautions which may be prescribed by the police.

78. The head of the Civil Government is empowered to make regulations in all matters respecting the extent, position, and formation of cemeteries, the manner of burying corpses, and the general police of such places.

81. It is the duty of every person to whom the officer indicated in article 80 may have provided water, to assure himself that the cistern in which the water is to be contained, and the conduits or tubes through which it must pass, be not broken or damaged in any such way that the water supplied may be in any quantity wasted.

82. Every persons shall avoid causing, by his negligence, the opening, breaking, or damaging of any lock, earthen pipe, tube, door, or other appurtenance of any reservoir, or other receptacle of public water, or the waste of such water in any other manner.

83. Every person shall avoid causing, by his negligence, any manure, mud, or other noxious or offensive things to be introduced into the fountains, aqueducts, or other places destined for the preservation of the public water; or putrid waters or other offensive matters to percolate into them from sewers, drains, or other places; or the public water to be in any other way rendered foul or unwholesome.

84. It is prohibited to wash animals, clothes, or other things in, or to let animals drink from, fountains in which it is not specially permitted so to do, or to bathe or wash in any fountain or other receptacle destined for the preservation of public waters or for a public watercourse.

86. Every keeper of a slaughter-house shall maintain the same in a wholesome state, and remove the filth therefrom at least once in every twenty-four hours.

87. The head of the Civil Government is empowered to make regulations in regard to the grant of licences, and the registry and inspection of slaughter-houses.

89. It is prohibited within the limits of the cities of Valetta, Vittoriosa, Cospicua, and Senglea to slaughter or cause to be slaughtered any animals of the kind mentioned in the said tariff, in any other place than the slaughter-houses, without a licence from the police.

91. No person shall neglect to cause to be interred beyond the limits of any inhabited place, within twenty-four hours, the carcase of any animal belonging to the same, which might otherwise cause prejudice to the public health or annoyance to the neighbourhood.

92. The head of the Civil Government is empowered to make regulations for the purpose of prohibiting, ordering, or regulating the removal from one place to another of animals, meat, skins, horns, or other parts of animals, or of straw, hay, or other articles, which might probably infect the atmosphere, and cause the spread of contagious disease; for the purpose of purifying the stalls, or other places in which animals may be kept; for the object of arranging the way in which animals which may die in a state of sickness should be disposed of; and also for the purpose of ordering that the appearance of any disease amongst animals be reported.

95. It shall be lawful for any person to destroy any dog or other animal which may be found in the street, and may be reasonably suspected of being attacked with hydrophobia, or of having been bitten by a dog or other animal reasonably suspected of being attacked with hydrophobia.

110. It is prohibited to expose for sale any meat or fish which may be unfit for human food.

111. Any officer of police is empowered to enter into any place kept or used for the preservation or sale of meat or fish, and to search whether there exists therein any meat or fish unfit for human food; and if any be found therein, it is competent to the Court to order the same to be destroyed, or to be disposed of in any other way, so as to prevent its being used for human food.

112. Every shopkeeper shall keep in a clean and wholesome state both the interior of the shop and the external space around the shop within reasonable limit to be fixed by the police.

115. It shall be lawful for the head of the Civil Government to make regulations for the better discovery of any fraudulent practices, and for the preservation of good order and cleanliness in the markets.

116. It is prohibited to exercise the trade of baker, maker of bread, or miller without a licence from the police.

165. It is prohibited to leave in the ports or on the moles any merchandise or other rotten or unwholesome thing which might be prejudicial to the public health, or give rise to a nuisance.

219. No passage boat shall, without a permit from the officer appointed by the said superintendent, approach any vessel before she be admitted to pratique.

No. XXV.

ATTACKS and DEATHS from DIARRHŒA and CHOLERA among MEN, WOMEN, and CHILDREN of different CORPS, in all CLASSES of QUARTERS, during the EPIDEMIC of 1865.

Barrack, Quarters, and Corps.	Men.				Women.				Children.			
	Diarrhœa.		Cholera.		Diarrhœa.		Cholera.		Diarrhœa.		Cholera.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Royal Artillery.												
Plague Hospital	—	—	1	—	—	—	2	2	1	1	2	2
St. Salvatore Counterguard	—	—	—	—	—	—	8	3	—	—	1	1
St. Salvatore Tents	—	—	1	—	—	—	—	—	2	—	3	—
Fort Tigne	5	—	2	2	—	—	—	—	—	—	—	—
Upper St. Elmo.	31	—	5	2	1	—	1	—	—	—	—	—
Marsamuscetto	8	—	3	2	—	—	—	—	—	—	1	1
St. James' Cavalier	7	—	3	2	1	—	1	—	1	1	—	—
Fort St. Angelo	6	—	1	—	—	—	—	—	—	—	—	—
Fort Ricasoli	8	—	—	—	—	—	—	—	—	—	—	—
Fort St. Salvatore	11	—	2	2	—	—	—	—	—	—	—	—
In hired Quarters	2	—	1	1	—	—	—	—	1	1	—	—
2nd Batt. 4th Regiment.												
Floriana Barrack	16	3	5	4	—	—	—	—	—	—	—	—
Floriana Encampment	44	—	13	9	—	—	—	—	—	—	—	—
Notre Dame Ravelin	2	—	—	—	—	—	1	1	2	2	—	—
Left Horn Work	—	—	4	3	3	—	6	4	4	2	—	—
Gozo	1	—	—	—	—	—	—	—	—	—	—	—
School Master's Quarters, Floriana.	—	—	—	—	1	—	—	—	—	—	—	—
2nd Batt. 8th Regiment.												
Pembroke Camp	32	—	4	3	—	—	2	1	2	2	3	3
Fort Manoel	7	—	—	—	2	—	—	—	1	—	—	—
Forrest Hospital	—	—	1	1	—	—	—	—	—	—	—	—
Garrison Hospital	—	—	1	1	—	—	—	—	—	—	—	—
Plague Hospital	—	—	—	—	1	—	—	—	—	—	—	—
Quarters in Strada Mercanti	—	—	—	—	—	—	1	1	—	—	3	2
84th Regiment.												
Fort Verdala	51	—	12	7	2	—	1	1	9	1	—	—
Married Qts., Polverista	—	—	2	1	15	—	2	2	17	8	1	1
Notre Dame Bastion	—	—	—	—	—	—	—	—	—	—	2	2
Pembroke Camp	3	—	—	—	—	—	—	—	—	—	—	—
Zeitun Gate	—	—	—	—	—	—	1	1	—	—	2	2
Zabbar Gate	—	—	—	—	1	—	—	—	1	1	—	—
Upper Vittoriosa Hospital	1	—	4	3	—	—	—	—	2	—	—	—
Sanitarium, Citta Vecchia	—	—	2	2	—	—	—	—	—	—	—	—
Royal Engineers.												
St. Francis, Floriana	10	1	—	—	—	—	—	—	—	—	—	—
1st Batt. 22nd Regiment.												
St. Franceso de Paola	2	—	3	1	1	—	—	—	—	—	—	—
St. John's Curtain	—	—	2	2	2	—	—	—	2	—	2	2
Isola Gate	—	—	3	2	—	—	—	—	—	—	—	—
Polverista Barrack	—	—	3	1	—	—	—	—	—	—	—	—
Burmola Curtain	—	—	1	1	1	—	3	2	2	—	—	—
St. Nicholas Bastion	—	—	—	—	—	—	1	1	—	—	—	—
St. Francis, Floriana	—	—	—	—	—	—	1	1	—	—	—	—
Inquisitors Palace	—	—	—	—	1	—	—	—	—	—	—	—
Officers' Quarters, Isola Gate	—	—	1	1	—	—	—	—	—	—	—	—
Lower Vittoriosa Hospital	—	—	1	1	—	—	—	—	—	—	—	—
29th Regiment.												
Fort Ricasoli	54	—	6	5	8	—	6	6	27	8	3	3
Pembroke Camp	29	—	7	6	—	—	1	1	2	2	1	1
Zabbar Gate	11	—	—	—	—	—	—	—	—	—	—	—
Salvatore	1	—	—	—	—	—	—	—	—	—	—	—
Cottonera	—	—	—	—	—	—	2	2	—	—	—	—
Vittoriosa Hospital	—	—	2	2	—	—	—	—	—	—	—	—
[illegible]est Hospital	—	—	2	2	—	—	—	—	—	—	—	—

Attacks and Deaths from Diarrhœa and Cholera among Men, Women, and Children of different Corps, &c.—*continued.*

Barrack, Quarters, and Corps.	Men.				Women.				Children.			
	Diarrhœa.		Cholera.		Diarrhœa.		Cholera.		Diarrhœa.		Cholera.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
100th Regiment.												
Lower St. Elmo	26	—	12	9	2	—	—	—	2	1	1	—
Prison and Cells	1	—	1	1	—	—	—	—	—	—	—	—
Encampment, Fort Manoel	48	—	6	5	—	—	—	—	—	—	—	—
St. Michael's Guard	—	—	1	1	—	—	—	—	—	—	—	—
Crown Work	5	—	—	—	2	—	1	1	—	—	—	—
Horn Work	—	—	—	—	3	—	1	1	1	—	—	—
Pembroke Camp	1	—	—	—	—	—	1	1	—	—	—	—
Garrison Hospital	2	—	2	2	—	—	—	—	1	—	—	—
Auberge de Bavière	2	—	—	—	—	—	—	—	—	—	—	—
Sliema	—	—	—	—	—	—	1	—	—	—	1	—
Army Hospital Corps.												
Gateway, Notabile	—	—	—	—	—	—	1	1	—	—	—	—
Tower, Notabile	—	—	—	—	—	—	1	—	—	—	—	—
Royal Malta Fencible Artillery.												
Lascaris	44	—	8	4	—	—	—	—	—	—	—	—
Couvre Porte	8	—	1	—	—	—	—	—	—	—	—	—
St. Elena	12	—	—	—	—	—	—	—	—	—	—	—
Hospital	1	—	—	—	—	—	—	—	—	—	—	—
Quarters in Cities	4	—	—	—	—	—	—	—	—	—	—	—

LIBRARY OF THE SURGEON GENERAL'S OFFICE BRANCH OF THE ARMY

No. XXVI.

LIST of SANITARY SERVICES executed in each BARRACK and HOSPITAL in MALTA and GOZO from the 1st June 1863 to the 1st June 1865.

Name of Barrack and Hospital.	Nature and Extent of Sanitary Services executed.
GENERAL HOSPITAL	Long Ward.—Ten additional windows inserted, 35 inlets for fresh air made in the side walls, and seven Muir's ventilators inserted in the roof. Five cross walls removed, three built, opening at end of ward enlarged, and sash inserted. Ward 41.—Artillery surgery and adjoining rooms and ward over surgery, three windows inserted and 10 enlarged. 21 inlets for air made, two Muirs' ventilators inserted. Partition walls removed und archways formed so as to convert two small rooms and a closet into an airy apartment. Wards on North Side Upper Floor.—Ten windows enlarged and cut down. Additional door windows inserted, useless partition removed, 22 air inlets, and five Muir's ventilators inserted. Wards on South Side Upper Floor.—One window enlarged, six inserted, seven air-inlets made, and four of Muir's ventilators fixed. Latrines.—Surgeons' watercloset fitted with English apparatus. Women's latrine reconstructed, water laid on. Watercloset constructed for the gate-keeper, guard, and officers' servants. Ward 22.—Window space enlarged and ward ventilated. Royal Ward.—A covered barracca or day room constructed outside the ward.
UPPER ST. ELMO	Barrack Rooms generally and Cells.—The ventilation improved by the provision of inlets and extraction shafts, and by the enlarging and glazing of all the window openings. Ablution Room.—Cistern connected with aqueduct. Three baths and footpans fixed in the room adjoining. Canteen.—Windows enlarged, inlet and extraction shafts provided.
LOWER ST. ELMO	Latrines.—Patent apparatus provided. Soldiers' Rooms.—Area space formed and ventilation shafts constructed.

List of Sanitary Services executed in each Barrack and Hospital in Malta—*continued.*

Name of Barrack and Hospital.	Nature and Extent of Sanitary Services executed.
Military Prison	Cook-House enlarged and ventilated. Cells.—Four paved with hard stone. Ablution Room.—Floored in hard stone, patent washing range inserted. Latrine.—Patent apparatus fixed, two urinals fixed. Drainage.—Latrines, cook-house, ablution-room, and urinals connected with the main drain.
Auberge de Castile	Waterclosets and urinals for officers and servants provided.
Lascaris Barracks	Latrine constructed on Macfarlane's principle and water laid on. The upper level drained.
Floriana Barracks	Rooms under Civil Hospital ventilated and lighted. Pavilion.—Proper water-closets provided for the officers and servants.
St. Francis Barracks	Rooms generally.—The window space increased and the ventilation improved. Large window provided in room 5. Rooms 9, 10, 11 made into one by the removal of the partitions. Guard room and cells ventilated. Married quarters ventilated. Drainage.—Carried to the sea. Latrine.—Jennings' latrine fixed in married quarters and drained into main drain.
Fort Manoel	Ventilation.—All the rooms under Misida Cavalier and the barrack rooms on each side of the parade ventilated. An open drain from the Lazzaretto covered in.
Fort Tigne	Barrack Rooms.—Loopholes glazed.
Pembroke Camp	Constructing a filtering tank. Constructing two porches, Nos. 6 and 7. Soldiers' rooms fitting with wash-hand basins and night urinals.
Citta Vecchia Sanitarium	Wards.—Ventilated and a verandah erected.
Fort Ricasoli	Ventilation.—Rooms 1 to 12, canteen, and cells, ventilated with inlets and extraction shafts. Wall in front of barrack rooms removed. Bighi front ventilated. Drainage.—Sewage conveyed direct to the sea. Water Supply.—Tank No. 7 connected with aqueduct. Force pump fixed over Nos. 6 and 13 tanks and near latrines. Cisterns constructed and pipes fixed to supply the ablution rooms, cook-house, and latrines with water. Ablution Rooms.—Limestore converted into an ablution room, and with the other ablution rooms provided with Macfarlane's fitments. Latrines.—Provided with improved apparatus and urinals.
St. Angelo	Drainage.—Outlets altered to convey the sewage to the sea.
Fort Salvatore	Ventilation.—Soldiers' rooms ventilated. Embrazures opened in Nos. 1 and 10 rooms and windows in 6 and 8 rooms. Intermediate floor removed in room 12. Water Supply.—Tank connected with aqueduct. Force pump fixed to tank 43. Cistern constructed, and water laid on to cook-house, ablution room, and latrines. Married quarters supplied from tank 42. Latrines.—Fitted with improved apparatus.
Polverista Barrack	Ventilation.—Inlets and extraction shafts constructed in the rooms generally. Drainage.—Latrines, ablution room, and cook-house drained into the main drain. Water Supply.—Cistern constructed and force pump provided, and water laid on to the ablution room, cook-house, and latrines. Ablution Room.—Properly fitted up. Macfarlane's apparatus. Latrines provided with improved apparatus and urinals.
Isola Barracks	Ventilation and light improved.
Zabbar Gate	Ventilation improved.
Gozo	Nil.

Edward W. Durnford, Colonel,
Commanding Royal Engineers.

TABLE XXVII.—SHOWING the VESSELS placed in QUARANTINE, and PERSONS landed at the LAZZARETTO at MALTA, on account of suspected CHOLERA, between the 1st August 1865, and the date at which Quarantine on account of Cholera was finally discontinued.

Date of Arrival.	Name of Ship.	Tonnage.	Port whence last cleared.	Number of Days detained in Quarantine.	Number of Persons detained in Quarantine.	Cases received from each Ship into the Lazzaretto.				Cases occurring in Quarantine.			
						Diarrhœa.		Cholera.		Diarrhœa.		Cholera.	
						Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1865.													
August 1	"Lybia"	1,044	Alexandria	7	22	—	—	—	—	—	—	—	—
„ 3	"Quintus"	448	Constantinople	7	2	—	—	—	—	—	—	—	—
„ 4	"Samanut"	—	Alexandria	12	1	One case of Diarrhœa.		—	—	—	—	—	—
„ 10	"Mary Ann"	319	Constantinople	7	3	—	—	—	—	—	—	—	—
„ 11	"Massilia"	1,308	Alexandria	7	3	—	—	—	—	—	—	—	—
„ 11	"City of Durham"	370	Constantinople	7	10	—	—	—	—	—	—	—	—
„ 11	"Virginia"	545	Do.	7	1	—	—	—	—	—	—	—	—
„ 14	"Isis"	1,430	Alexandria	7	10	—	—	—	—	—	—	—	—
„ 14	"Pera"	1,373	Marseilles	10	15	—	—	—	—	—	—	—	—
„ 16	"Annie Duncan"	223	Smyrna	20	1	—	—	—	—	—	—	—	—
„ 17	"Syria"	1,308	Alexandria	10	3	—	—	—	—	—	—	—	—
„ 20	"Asie"	467	Do.	10	11	—	—	—	—	—	—	—	—
„ 21	"Saida"	1,107	Do.	10	15	—	—	—	—	—	—	—	—
„ 22	"Memnon"	927	Do.	10	2	—	—	—	—	—	—	—	—
„ 22	"Presidente"	194	Constantinople	20	9	—	—	—	—	—	—	—	—
„ 22	"Massilia"	1,308	Marseilles	10	10	—	—	—	—	—	—	—	—
„ 23	"Rose"	295	Constantinople	20	6	—	—	—	—	—	—	—	—
„ 23	"Tertius"	357	Do.	20	4	—	—	—	—	—	—	—	—
„ 23	"Evângelistria"	218	Do.	20	8	—	—	—	—	—	—	—	—
„ 25	"Paraguay"	1,210	Do.	20	19	—	—	—	—	—	—	—	—
„ 28	"Dio Adelfi"	293	Do.	20	1	—	—	—	—	—	—	—	—
„ 28	"Assyrien"	510	Alexandria	10	1	—	—	—	—	—	—	—	—
„ 30	"Syria"	1,308	Marseilles	10	1	—	—	—	—	—	—	—	—
September 1	"Delta"	1,308	Alexandria	10	3	—	—	—	—	—	—	—	—
„ 3	"Robert Stevenson"	295	Constantinople	20	2	—	—	—	—	—	—	—	—
„ 6	"Thebes"	1,732	Alexandria	10	16	—	—	—	—	—	—	—	—
„ 6	"Shearwater"	569	Do.	10	1	—	—	—	—	—	—	—	—
„ 8	"Adalia"	1,022	Do.	10	15	—	—	—	—	—	—	—	—
„ 8	"Nyanza"	2,000	Marseilles	12	7	—	—	—	—	—	—	—	—
„ 9	"Vectis"	—	Alexandria	10	8	—	—	—	—	—	—	—	—
„ 10	"Asie"	477	Marseilles	10	2	One case of Diarrhœa.		—	—	—	—	—	—
„ 10	"Syria"	1,308	Alexandria	10	1	—	—	—	—	—	—	—	—
„ 10	"Ceylon"	1,307	Do.	10	1	—	—	—	—	—	—	—	—
„ 11	"Elena"	200	Constantinople	20	1	One case of Diarrhœa.		—	—	—	—	—	—
„ 11	"Adelfotis"	289	Do.	20	1	—	—	—	—	—	—	—	—
„ 11	"Caradoc"	—	Do.	20	1	—	—	—	—	—	—	—	—
„ 13	"Luxor"	1,212	Alexandria	10	8	—	—	—	—	—	—	—	—
„ 13	"Independence"	134	Constantinople	20	1	One case of Diarrhœa.		—	—	—	—	—	—
„ 16	"Massilia"	1,308	Marseilles	10	4	—	—	—	—	—	—	—	—
„ 18	"Cavalier Baumgartino."	340	Constantinople	20	8	—	—	—	—	—	—	—	—
„ 19	"Behera"	1,142	Alexandria	10	22	One case of Diarrhœa.		—	—	—	—	—	—
„ 22	"Syria"	1,308	Marseilles	10	1	—	—	—	—	—	—	—	—
„ 24	"Dido"	1,125	Alexandria	10	7	—	—	—	—	—	—	—	—
„ 25	"Ripon"	1,308	Do.	10	1	—	—	—	—	—	—	—	—
„ 27	"Majestic"	344	Do.	10	11	—	—	—	—	—	—	—	—
„ 28	"Arcadia"	740	Do.	10	9	—	—	—	—	—	—	—	—
„ 28	"Evangelistria"	325	Constantinople	20	1	—	—	—	—	—	—	—	—
„ 29	"Giov. Avierius"	281	Do.	20	1	—	—	—	—	—	—	—	—
„ 30	"Christina"	692	Alexandria	10	2	—	—	—	—	—	—	—	—
October 1	"Poonah"	1,308	Marseilles	10	4	—	—	—	—	—	—	—	—
„ 1	"Assurance"	—	Constantinople	20	4	—	—	—	—	—	—	—	—
„ 3	"Sultanya"	177	Algiers	20	10	—	—	—	—	—	—	—	—
„ 5	"Tanjore"	2,100	Alexandria	10	1	—	—	—	—	—	—	—	—
„ 6	"Giptis"	613	Marseilles	10	4	—	—	—	—	—	—	—	—
„ 7	"La Plata"	1,005	Smyrna	20	10	—	—	—	—	—	—	—	—
„ 8	"Ripon"	1,308	Marseilles	10	5	—	—	—	—	—	—	—	—
„ 8	"Junon"	649	Alexandria	10	9	—	—	—	—	—	—	—	—
„ 8	"Feliz Unias"	322	Constantinople	20	1	—	—	—	—	—	—	—	—
„ 10	"Isis"	1,436	Alexandria	1	10	—	—	—	—	—	—	—	—
„ 11	"Mongolia"	1,946	Do.	8	2	—	—	—	—	—	—	—	—
„ 13	"Amalia"	1,284	Do.	6	1	—	—	—	—	—	—	—	—
„ 14	"Tanjore"	2,100	Marseilles	10	3	—	—	—	—	—	—	—	—
„ 17	"Ripon"	1,308	Alexandria	3	1	—	—	—	—	—	—	—	—
„ 22	"Mongolia"	1,946	Marseilles	10	2	—	—	—	—	—	—	—	—
„ 26	"Junon"	649	Do.	10	8	One case of Diarrhœa.		—	—	—	—	—	—
October 27	"Assyrien"	515	Do.	10	2	—	—	—	—	—	—	—	—
„ 28	"Syria"	1,308	Gibraltar	3	23	—	—	—	—	—	—	—	—
„ 30	"Pera"	1,373	Marseilles	7	6	—	—	—	—	—	—	—	—
November 2	"Psyche"	—	Naples	10	7	—	—	—	—	—	—	—	—
„ 5	"Italian"	1,560	Alexandria	10	36	—	—	—	—	—	—	—	—

Table XXVII.—Showing the Vessels placed in Quarantine and Persons landing at the Lazzaretto at Malta, &c.—*continued.*

Date of Arrival.	Name of Ship.	Tonnage.	Port whence last cleared.	Number of Days detained in Quarantine.	Number of Persons detained in Quarantine.	Cases received from each Ship into the Lazzaretto.				Cases occurring in Quarantine.			
						Diarrhœa.		Cholera.		Diarrhœa.		Cholera.	
						Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1865.													
„ 7	"Pera"	1,373	Alexandria	7	3	—	—	—	—	—	—	—	—
„ 8	"Delta"	1,308	Marseilles	7	15	—	—	—	—	—	—	—	—
„ 11	"Island Queen"	257	Alexandria	10	1	—	—	—	—	—	—	—	—
„ 14	"Nyanza"	2,000	Marseilles	7	6	—	—	—	—	—	—	—	—
„ 20	"Europa"	713	Do.	5	26	—	—	—	—	—	—	—	—
„ 21	"Gyptis"	613	Do.	4	13	—	—	—	—	—	—	—	—
„ 22	"Syria"	1,308	Do.	5	4	—	—	—	—	—	—	—	—
„ 27	"Dido"	1,125	Alexandria	5	1	—	—	—	—	—	—	—	—
„ 28	"Palestine"	936	Smyrna	10	2	—	—	—	—	—	—	—	—
„ 30	"Saida"	1,109	Alexandria	7	43	—	—	—	—	—	—	—	—
„ 30	"Ripon"	1,308	Do.	4	5	—	—	—	—	—	—	—	—
December 2	"Massilia"	1,308	Marseilles	4	5	—	—	—	—	—	—	—	—
„ 3	"Ang. Raffaele"	46	Vietri	10	1	—	—	—	—	—	—	—	—
„ 3	"Sesostris"	1,607	Alexandria	7	82	—	—	—	—	—	—	—	—
„ 4	"Assyrien"	510	Marseilles	1	6	—	—	—	—	—	—	—	—
„ 4	"Kars"	—	Constantinople	7	3	—	—	—	—	—	—	—	—
„ 4	"Algerie"	429	Marseilles	3	1	—	—	—	—	—	—	—	—
„ 6	"Ulisse"	32	Castellamare	10	1	—	—	—	—	—	—	—	—
„ 7	"Niphon"	650	Alexandria	3	1	—	—	—	—	—	—	—	—
„ 8	"Gyptis"	613	Do.	3	20	—	—	—	—	—	—	—	—
„ 9	"Poonah"	1,308	Marseilles	4	8	—	—	—	—	—	—	—	—

Port Department, Malta,
25th April 1867.

(Signed) WM. HOSEASON,
Superintendent of the Ports.

LIST of VESSELS arrived in QUARANTINE at MALTA from PORTS affected or suspected of CHOLERA (not landing Passengers) between August 1st 1865, and the date at which QUARANTINE on account of CHOLERA was finally discontinued.

Date of Arrival.	Name of Ship.	Tonnage.	Port whence cleared.	Number of Days in Quarantine.	Number of Crew.	REMARKS. Cases of Cholera or Diarrhœa which were found on board or arrived in Quarantine.
1865.						
August 1	"Pera"	1,370	Alexandria	1	128	—
„ 1	"Poonah"	1,308	„	1	135	—
„ 3	"Byzantine"	516	„	2	42	—
„ 4	"Palestine"	936	Smyrna	1	55	—
„ 4	"Irabulus Garb"	218	Alexandria	2	18	—
„ 5	"Porto Salvo"	108	Constantinople	7	14	—
„ 6	"Mari A. Vagliano"	298	„	7	13	—
„ 6	"Benedetto"	246	„	7	11	—
„ 6	"Baharia"	177	Gibraltar	18	3	—
„ 7	"Arabian"	1,695	Alexandria	1	37	—
„ 7	"Ida"	370	Constantinople	2	13	—
„ 10	"Ant. Avierino"	219	„	7	10	—
„ 11	"Sincere"	142	Alexandria	1	8	—
„ 11	"Ripon"	1,308	„	1	112	—
„ 11	"Gio. Batta Revello"	189	Constantinople	7	11	—
„ 14	"Redar"	1,213	Alexandria	1	56	—
„ 14	"Constance"	422	„	1	21	—
„ 15	"Jarrow"	414	„	1	18	—
„ 15	"Thessaglia"	794	Smyrna	1	39	—
„ 15	"Due Parenti"	273	Constantinople	3	13	—
„ 16	"Cairo"	995	„	1	30	—
„ 16	"Emil"	172	Alexandria	10	8	—
„ 17	"Roussan Bahri"	154	Marseilles	10	11	—
„ 17	"Persian"	1,770	Alexandria	1	39	—
„ 18	"Euxine"	1,165	„	1	84	—
„ 18	"Aurora"	249	Smyrna	2	11	—
„ 18	"Aleppo"	1,458	Constantinople	1	55	—
„ 19	"Nuova Assunta"	125	Alexandria	2	9	—
„ 19	"Panaja Ipapandi"	265	Constantinople	20	11	—
„ 20	"Octavia"	678	Gibraltar	1	54	—
„ 20	"Iede"	491	Constantinople	6	14	—
„ 20	"Soudan"	184	Gibraltar	2	15	—
„ 22	"Nyanza"	2,000	Alexandria	1	113	—
„ 22	"Indipendente"	271	Constantinople	2	11	—
„ 22	"Marigo"	149	„	4	8	—
„ 22	"Delta"	1,308	Gibraltar	1	103	—
„ 23	"Pera"	1,373	Alexandria	1	128	—
„ 23	"Ganges"	422	Constantinople	20	13	One case of diarrhœa.
„ 24	"Nil Desperandum"	291	Damiata	1	10	—

Table XXVII.—List of Vessels arrived in Quarantine at Malta from Ports affected or suspected of Cholera, &c.—*cont.*

Date of Arrival.	Name of Ship.	Tonnage.	Port whence cleared.	Number of Days in Quarantine.	Number of Crew.	Remarks. Cases of Cholera or Diarrhœa which were found on board or arrived in Quarantine.
1865.						
August 24	"Pasqualina"	462	Constantinople	2	13	—
„ 25	"Dossouk"	1,062	Alexandria	10	82	—
„ 26	"Milbanke"	547	„	1	22	—
„ 26	"Atlas"	1,219	Constantinople	1	57	—
„ 27	"Jane Francis"	346	Damiata	2	10	—
„ 28	"Eftanisos"	210	Constantinople	11	12	—
„ 28	"Criti"	429	„	4	12	—
„ 28	"Niord"	410	„	2	14	—
„ 28	"S. Gerasimo"	175	„	9	8	—
„ 28	"Stefano"	311	Marseilles	8		
„ 31	"Massilia"	1,308	Alexandria	1		
September 1	"Toronto"	350	Cyprus	3		
„ 2	"Demetrius"	418	Alexandria	2		
„ 2	"Hecla"	1,213	„			
„ 2	"Ionia"	943	„			
„ 4	"Haralambo"	219	Constantinople			
„ 5	"Byzantin"	515	Alexandria			
„ 6	"Italian"	1,160	Constantinople			
„ 9	"Sara"	181	Marseilles			
„ 10	"Meander"	662	Alexandria			
„ 11	"Urano"	181	Constantinople			
„ 11	"Aspasia"	274	„			
„ 11	"Protis"	201	Marseilles			
„ 11	"Cleopatra"	428	Constantinople			
„ 12	"Angelica"	305	„			
„ 12	"Gabaria"	109	Gibraltar			
„ 13	"Stately"	373	Constantinople			
„ 13	"S. Elena"	179	„			
„ 14	"Dalmatian"	1,692	Alexandria			
„ 14	"Crimean"	1,002	„			
„ 14	"Mary"	172	Constantinople			
„ 15	"Montfalnet"	503	Marseilles	1		
„ 18	"Pandodinomas"	242	Constantinople	20		
„ 18	"Evangelistria"	196	„	11	11	
„ 18	"Giorgio Protos"	255	„	3	10	
„ 18	"Una"	1,006	„	1	32	
„ 18	"Melita"	853	„	1	34	
„ 19	"Milan"	736	„	1	33	
„ 21	"Junon"	649	Marseilles	1	37	
„ 21	"Poonah"	1,308	Alexandria	1	132	
„ 22	"Nyanza"	2,000	„	1	113	
„ 22	"Tiber"	980	„	1	31	
„ 23	"Birch Grove"	518	„	12	15	
„ 25	"Sahara"	1,073	„	1	36	
„ 26	"Massilia"	1,308	„	1	98	
„ 27	"Vauxhall"	153	Gibraltar	10	12	
„ 27	"Clorinda"	340	Constantinople	1	13	
„ 28	"Asie"	467	Alexandria	1	43	
„ 28	"Vederemo"	398	Constantinople	5	15	
„ 30	"Ruthinas"	626	„	2	16	
„ 30	"Ocean"	145	Gibraltar	10	9	
„ 30	"Febo"	383	Constantinople	5	15	
October 1	"Cairo"	153	Gibraltar	1	13	
„ 1	"Palestine"	936	Smyrna	1	56	
„ 1	"Cockatrice"	—	Constantinople	20	40	
„ 1	"Marietta"	269	„	20	11	
„ 2	"Sofia"	223	„	20	10	
„ 2	"Caragia"	145	„	20	10	
„ 3	"Bolivian"	1,366	Alexandria	1	49	
„ 3	"Ismir"	—	Scio	3	164	
„ 3	"Brousse"	—	„	3	170	
„ 4	"Calpe"	1,134	Alexandria	1	31	
„ 4	"S. Tommaso"	46	Trani	20	9	
„ 4	"Ocean King"	554	Alexandria	1	23	
„ 4	"Irane"	322	Marseilles	1	11	
„ 5	"Syria"	1,308	Alexandria	1	110	
„ 5	"Armonia"	326	Smyrna	5	10	
„ 6	"Zino"	272	Constantinople	7	13	
„ 6	"N. S. del Boschetto"	168	„	16	9	
„ 7	"Agia Sofia"	977	Alexandria	1	37	
„ 7	"Adelfi Vagliano"	268	Constantinople	15	11	
„ 7	"Bianca"	370	„	2	14	
„ 7	"Phenicien"	400	Alexandria	1	28	
„ 9	"Rimisis Panaja"	119	Constantinople	13	7	
„ 9	"Syrian"	1,014	Alexandria	1	37	
„ 11	"Tarifa"	1,458	„	1	54	
„ 11	"Arabian"	1,695	„	1	38	
„ 11	"Poonah"	1,308	„	1	135	
„ 11	"Assunta"	203	Constantinople	8	9	
„ 13	"Hector"	1,295	Alexandria	1	32	
„ 13	"Profeta Elia"	215	Constantinople	7	10	
„ 14	"California"	155	Gibraltar	10	8	
„ 14	"Irma"	168	Damiata	4	8	
„ 15	"Ellen Constance"	516	Constantinople	1	23	
„ 17	"Pera"	1,375	Alexandria	1	129	
„ 20	"Cossack"	—	Beyrout	2	275	
„ 20	"Pomona"	122	Gibraltar	10	6	
„ 22	"Ciscar"	321	Mahon	4	16	

Table XXVII.—List of Vessels arrived in Quarantine at Malta from Ports affected or suspected of Cholera, &c.—*cont.*

Date of Arrival.	Name of Ship.	Tonnage.	Port whence cleared.	Number of Days in Quarantine.	Number of Crew.	Remarks. Cases of Cholera or Diarrhœa which were found on board or arrived in Quarintine.
1865.						
October 22 -	"Phenicien" - -	460	Marseilles - -	1	29	—
„ 23 -	"Evangelistria" -	199	Constantinople - -	10	8	—
25 -	"Demetrius" - -	180	„ - -	6	12	—
25 -	"Flora" - -	51	Castellamare - -	7	7	—
26 -	"Pelican" - -	—	Palermo - - -	10	175	—
2	"Phœbe" - -	—	Messina - - -	10	515	—
	"Gamsbock" - -	467	Marseilles - -	6	14	—
	"Algerie" - -	428	„ - -	1	38	—
	"zropardi" - -	254	Constantinople - -	3	13	—
	-	359	„ - -	6	11	—
	-	—	Naples - - -	4	1,050	—
	-	927	Alexandria - -	1	35	—
		649	„ - -	2	38	—
			„ - -	1	37	—
			Castellamare - -	10	6	—
			„ - -	10	7	—
			Trieste - - -	10	14	—
			„ - -	8	20	—
			Vietri - - -	10	8	—
			Alexandria - -	1	109	—
			„ - -	1	103	—
			Vietri - - -	10	9	—
			Marseilles - -	1	7	—
			Trieste - -	2	8	—
			Alexandria - -	1	37	—
			„ - -	1	38	—
			Messina - -	4	19	—
			Smyrna - -	1	31	—
			Alexandria - -	1	134	—
			„ - -	1	23	—
			„ - -	1	109	—
			Torre Annunta - -	8	14	—
			Alexandria - -	1	42	—
	- -	—	Marseilles - -	4	67	—
	- -	984	Alexandria - -	1	65	—
	- -	1,308	„ - -	1	114	—
	- -	740	„ - -	1	36	—
	- -	943	„ - -	1	32	—
	- -	185	Marseilles - -	10	8	—
	- -	105	Trieste - - -	10	8	—
	"acolata" - -	97	Castellamare -	10	9	—
	"a" - -	123	Trieste - - -	10	7	—
	henicien" - -	400	Mersina - - -	1	29	—
	Peruvian" - -	1,713	Alexandria - -	2	52	—
	"Amalia" - -	1,284	„ - -	1	45	—
„ 10 -	"S. Vzo. Terreri" -	77	Naples - - -	10	9	—
„ 12 -	"Stromboli" - -	280	Marseilles - -	1	23	—
„ 12 -	"Gio. Attilio" - -	79	Trieste - - -	10	7	—
„ 13 -	"S. Antonio" - -	52	Salerno - - -	4	9	—
„ 15 -	"N. Sa. della Prov. La"	103	Tripoli di Soria -	10	8	—
„ 17 -	"Ang. Raffaele" -	69	Salerno - - -	10	8	—
„ 24 -	"Milano" - -	312	Naples - - -	1	35	—
„ 28 -	"Milano" - -	312	Messina - - -	1	35	—

Port Department, Malta,
April 25th, 1867.

(Signed) WM. HOSEASON,
Superintendent of the Ports.

RETURN of the VESSELS, CREWS, and PASSENGERS arriving in QUARANTINE from places infected with CHOLERA from 1st January to 31st December 1866.

Date of Arrival.	Name of Vessel.	Tonnage.	From whence.	Number of Days in "Quarantine."	Number of Crew.	Passengers Landed in the "Lazzaretto."		Remarks. Cases of Cholera or Diarrhœa, &c.
						Number.	Days in "Quarantine."	
1866.								
March 13 -	"Milo" - - -	637	Alexandria - -	2	23	—	—	—
„ 15 -	"Dido" - - -	1,125	„ - -	1	32	11	5	—
July 3 -	"Ghizek" - -	84	Liverpool - -	3	13	—	—	—
„ 3 -	"Lacoima" - -	782	„ - - -	2	35	—	—	—
„ 5 -	"Atfith" - - -	84	„ - - -	1	13	—	—	—
„ 20 -	"Euxene" - - -	613	Marseilles - -	4	39	3	15	—
„ 22 -	"Pera" - - -	1,373	„ - - -	1	121	6	15	—
„ 25 -	"Demetrius" - -	418	Liverpool - -	1	23	—	—	—
„ 26 -	"Peppina" - -	114	Marseilles - -	15	8	—	—	—
„ 28 -	"Imperatore Diocleziano."	242	Liverpool - -	8	10	—	—	—
29 -	"Tanjore" - -	2,100	Southampton - -	1	124	4	15	—
29 -	"Suez" - -	337	Liverpool - -	7	12	—	—	—
30 -	"Nyanza" - -	2,000	Marseilles - - -	1	114	—	—	—

Table XXVII.—Return of the Vessels, Crews, and Passengers arriving in Quarantine, &c.—*continued.*

Date of Arrival.	Name of Vessel.	Tonnage.	From whence.	Number of Days in "Quarantine."	Number of Crew.	Passengers Landed in the "Lazzaretto."		Remarks. Cases of Cholera or Diarrhœa, &c.
						Number.	Days in "Quarantine."	
August 1	"Behera"	1,142	Alexandria	1	39	—	—	—
,, 1	"Egyptian"	1,689	Liverpool	2	38	—	—	—
,, 1	"Pera"	1,373	Alexandria	1	124	—	—	—
,, 3	"Tiber"	980	Cardiff	1	30	—	—	—
,, 3	"Margaret"	314	Sunderland	2	11	—	—	—
,, 4	"Isis"	1,436	Liverpool	1	43	—	—	—
,, 5	"Adalia"	1,026	,,	1	34	—	—	—
,, 5	"Robin Hood"	26	Gibraltar	2	7	—	—	—
,, 5	"Poonah"	1,308	Southampton	2	125	—	—	—
,, 6	"Hellenis"	603	London	3	27	—	—	—
,, 7	"Delta"	1,308	Marseilles	1	109	—	—	—
,, 8	"Atlas"	1,219	Liverpool	1	57	1	19	One case of diarr
,, 8	"Asia"	923	Cardiff	5	40	—	—	—
,, 10	"Erme"	206	Liverpool	1	10	—	—	—
,, 11	"Trontes"	538	,,	6	30	2	9	—
,, 12	"Hector"	1,295	Sunderland	8	32	—	—	—
,, 12	"Gustav Pastor"	484	Antwerp	15	22	—	—	—
,, 12	"Fanny Lambert"	536	Cardiff	6	21	—	—	—
,, 13	"Syria"	1,308	Southampton	1	109	1	15	—
,, 13	"Viesus"	205	Bouc	15	8	—	—	—
,, 14	"Lybia"	1,044	Constantinople	3	34	—	—	—
,, 14	"Ceylon"	1,308	Marseilles	2	121	5	15	—
,, 15	"Delta"	1,308	Alexandria	2	109	1	8	—
,, 16	"Poonah"	1,308	,,	1	125	2	7	—
,, 16	"Livonia"	872	Constantinople	4	27	—	—	—
,, 18	"Lady Derby"	436	,,	1	17	—	—	—
,, 18	"Thessalia"	794	Liverpool	2	36	—	—	—
,, 18	"Tachta"	139	,,	4	11	—	—	—
,, 18	"B.L. No. 675"	135	Algiers	15	12	—	—	—
,, 20	"Sabaina"	643	Falmouth	6	24	—	—	—
,, 20	"China"	1,340	Southampton	3	123	5	15	—
,, 21	"Syria"	1,308	Alexandria	2	109	—	—	—
,, 21	"Theban"	436	Glasgow	3	20	—	—	—
,, 21	"Euxene"	613	Marseilles	1	38	3	15	—
,, 21	"Danube"	994	Liverpool	4	29	—	—	—
,, 21	"Agia Sofia"	977	,,	4	39	—	—	—
,, 21	"Saida"	1,109	,,	2	38	—	—	—
,, 22	"West of England"	490	Cardiff	1	22	—	—	—
,, 22	"Grecian"	1,555	Liverpool	4	38	—	—	—
,, 23	"Tanjore"	2,100	Marseilles	2	124	—	—	—
,, 23	"Ceylon"	1,308	Alexandria	2	121	—	—	—
,, 23	"Coumoundouros"	764	Constantinople	4	31	4	5	—
,, 23	"Kadi Keni"	160	Plymouth	3	19	—	—	—
,, 23	"Arcadia"	740	Liverpool	2	38	—	—	—
,, 24	"Corinthia"	413	New Port	8	13	—	—	—
,, 24	"Eden"	343	Sunderland	2	10	—	—	—
,, 24	"Onward"	161	New Port	15	[illegible]	—	—	—
,, 25	"Divina Providenza"	55	Castellamare di Napoli.	10	7	—	—	—
,, 25	"Zealous"	292	Cardiff	13	10	—	—	—
,, 25	"Evangelistria"	424	Newcastle	4	12	—	—	—
,, 26	"Bernia Carboga"	268	Liverpool	15	10	—	—	—
,, 27	"Tasso"	598	Alexandria	1	21	—	—	—
,, 28	"Parana"	1,096	Constantinople	2	35	9	5	—
,, 28	"Ottavia"	369	Cardiff	15	14	—	—	—
,, 28	"Dalmatian"	1,692	Smyrna	2	38	14	3	—
,, 28	"Odessa"	1,457	London	3	53	—	—	—
,, 29	"Surat"	1,528	Southampton	2	138	10	15	—
,, 29	"Palestine"	936	Liverpool	1	54	—	—	—
,, 28	"Garabaldi"	489	Swansea	15	14	—	—	—
,, 29	"China"	1,340	Alexandria	1	123	8	7	—
,, 29	"Industry"	211	Cardiff	11	9	—	—	—
,, 29	"Amine Couvrie"	356	Shields	9	12	—	—	—
,, 30	"Rosetta"	747	Liverpool	1	30	—	—	—
,, 30	"Tanjore"	2,100	Alexandria	2	124	—	—	—
,, 31	"Catarina"	233	Constantinople	2	9	—	—	—
September 1	"Poonah"	1,308	Marseilles	1	125	1	15	—
,, 1	"Paraguay"	1,210	London	5	35	—	—	—
,, 1	"Mansour"	—	Alexandria	3	330	—	—	—
,, 2	"Tyne Queen"	539	Sulina	2	27	—	—	—
,, 2	"Egyptian"	374	Marseilles	1	34	2	15	—
,, 2	"Mancolia"	427	Carlisle	2	14	—	—	—
,, 3	"Phaician"	436	Glasgow and Tunis	1	20	3	15	—
,, 4	"Aspirant"	361	Shields	3	12	—	—	—
,, 4	"Pomona"	112	Vlaardingen	1	7	—	—	—
,, 4	"Cometa Donati"	58	Bona	15	7	29	15	—
,, 5	"John Fenwick"	575	Taganrog	2	22	—	—	—
,, 5	"Sesostris"	1,607	Liverpool	1	42	—	—	—
,, 5	"Massilia"	1,308	Southampton	1	106	6	15	—
,, 5	"S. Paolo"	37	Castellamare	15	8	—	—	—
,, 5	"Despina"	85	Constantinople	5	6	—	—	—
,, 5	"Laconia"	782	Liverpool	3	40	—	—	—
,, 5	"Milan"	736	,,	3	30	—	—	—
,, 6	"Cairo"	995	,,	3	32	—	—	—
,, 7	"Fre Fratelli"	184	Genoa	2	9	1	13	—
,, 7	"Syria"	1,308	Marseilles	1	109	5	15	—

Table XXVII.—Return of the Vessels, Crews, and Passengers arriving in Quarantine, &c.—*continued.*

Date of Arrival.	Name of Vessel.	Tonnage.	From whence.	Number of Days in "Quarantine."	Number of Crew.	Passengers Landed in the "Lazzaretto."		Remarks. Cases of Cholera or Diarrhœa, &c.
						Number.	Days in "Quarantine."	
1866.								
September 8	"Byzantine"	514	Marseilles	15	39	—	—	—
„ 8	"Peppina"	294	Genoa	—	11	—	—	Refused admittance into harbour, having a case of cholera on board. Only supplied with provisions, and proceeded on her voyage.
„ 8	"Miceli"	137	Constantinople	5	9	—	—	—
„ 10	"Surat"	1,528	Alexandria	1	132	—	—	—
„ 10	"Assunta"	563	Odessa	5	18	—	—	—
„ 11	"Poonah"	1,308	Alexandria	1	125	—	—	—
„ 11	"Azzopardi"	254	Marseilles	15	11	—	—	—
„ 11	"S. Nicola"	404	Constantinople	5	13	—	—	—
„ 12	"Egyptian"	1,689	Smyrna	1	38	9	5	—
„ 12	"Adela"	227	London	15	10	—	—	—
„ 12	"Sefora"	266	Cardiff	15	12	—	—	—
„ 12	"Fieres"	352	„	15	13	—	—	—
„ 12	"Virginia"	97	Bona	15	7	57	15	—
„ 13	"Ann Mills"	335	Cardiff	15	11	—	—	—
„ 13	"Camilla"	324	„	14	13	—	—	—
„ 13	"Speculator"	364	Shields	14	12	—	—	—
„ 13	"Arianna"	353	Cardiff	15	15	—	—	—
„ 13	"Orion"	380	Sunderland	14	13	—	—	—
„ 13	"Shamrock"	335	Cardiff	15	13	—	—	—
„ 13	"Positivo"	398	Constantinople	5	10	—	—	—
„ 13	"Tamar"	453	Newcastle	2	13	—	—	—
„ 13	"Phalia"	299	Cardiff	14	9	—	—	—
„ 14	"Pera"	1,373	Southampton	1	124	4	15	—
„ 14	"Earl Powis"	239	Naples	15	10	—	—	—
„ 14	"Elise"	76	Oran	15	7	—	—	—
„ 14	"Florence Pope"	207	Newport	13	8	—	—	—
„ 14	"Day"	315	Swansea	15	10	—	—	—
„ 14	"China"	1,340	Marseilles	1	123	15	15	—
„ 15	"Ada"	275	Constantinople	5	10	—	—	—
„ 15	"Behera"	1,142	Liverpool	3	38	1	14	—
„ 15	"Syria"	1,308	Alexandria	1	109	—	—	—
„ 15	"Massilia"	1,308	„	2	106	—	—	—
„ 15	"Emmanuele"	1,084	Cardiff	6	21	6	14	—
„ 16	"Aspasia"	275	Constantinople	5	10	—	—	—
„ 18	"Saida"	1,109	Alexandria	1	38	—	—	—
„ 18	"Atlas"	1,219	Smyrna	1	56	—	—	—
„ 18	"Battista"	45	Naples	—	6	—	—	Refused admittance into harbour, having a case of cholera on board. Only supplied with provisions, and proceeded on her voyage.
„ 18	"Mercurio"	185	Genoa	2	9	3	13	—
„ 18	"Stella"	314	Constantinople	4	15	—	—	—
„ 18	"Conte Serra"	228	„	5	12	—	—	—
„ 19	"Febo"	383	„	5	14	—	—	—
„ 19	"Barbarossa	370	Cardiff	15	13	—	—	—
„ 19	"Dapello"	300	Constantinople	4	12	—	—	—
„ 19	"Emmanuele"	226	„	5	9	—	—	—
„ 19	"Meeting"	447	„	4	15	—	—	—
„ 19	"Gelsomina"	131	Newcastle	7	9	—	—	—
„ 19	"Remo"	275	Swansea	15	11	—	—	—
„ 20	"Resistance"	—	Castellamare	3	457	—	—	—
„ 19	"Algeria"	52	Cagliari	4	6	—	—	—
„ 20	"Corriere"	140	„	4	12	—	—	—
„ 20	"Syrian"	1,014	Liverpool	2	38	1	15	—
„ 20	"Ceylon"	1,308	Southampton	2	123	13	15	—
„ 21	"Christina"	692	Liverpool	1	32	—	—	—
„ 21	"Thebes"	1,667	„	1	42	—	—	—
„ 21	"Protis"	205	Marseilles	2	23	27	7	—
„ 21	"Imonia"	165	Constantinople	5	7	—	—	—
„ 21	"Chiaima"	136	Tollonica	7	9	—	—	—
„ 22	"Surat"	1,528	Marseilles	1	139	5	15	—
„ 23	"Pera"	1,373	Alexandria	2	125	3	17	—
„ 24	"China"	1,340	„	1	123	—	—	—
„ 24	"Crimea"	196	Constantinople	5	8	—	—	—
„ 24	"Gyptis"	613	Marseilles	2	37	—	—	—
„ 25	"Etna"	346	Syracuse	2	32	47	15	—
„ 25	"Una"	1,006	Smyrna	2	34	10	15	—
„ 26	"Thessalia"	794	„	3	36	3	15	—
„ 26	"Guiseppina"	45	Orrechio di Porco	15	6	—	—	—
„ 26	"Lazareff"	1,427	London	2	45	—	—	—
„ 26	"Carmine"	384	Constantinople	5	14	—	—	—
„ 26	"Agia Sofia"	977	Alexandria	5	39	39	15	—
„ 27	"Brenda"	601	London	3	30	—	—	—
„ 27	"S. Natale"	26	Trapani	2	6	—	—	—
„ 27	"Angelico"	159	Constantinople	5	7	—	—	—
„ 28	"Concezione"	38	Siderno	7	10	—	—	—
„ 29	"Hector"	1,295	Constantinople	2	32	—	—	—
„ 29	"Giorgio"	220	„	5	9	—	—	—
„ 29	"Ceylon"	1,308	Alexandria	1	123	—	—	—

Table XXVII.—Return of the Vessels, Crews, and Passengers arriving in Quarantine, &c.—*continued.*

Date of Arrival.	Name of Vessel.	Tonnage.	From whence.	Number of Days in "Quarantine."	Number of Crew.	Passengers Landed in the "Lazzaretto."		Remarks. Cases of Cholera or Diarrhœa, &c.
						Number.	Days in "Quarantine."	
1866.								
September 29	"Goffredo"	304	Constantinople	5	13	1	5	—
„ 29	"Delta"	1,308	Southampton	1	108	16	15	—
„ 29	"Santo Padre"	24	Trapani	14	7	—	—	—
„ 29	"Surat"	1,528	Alexandria	2	132	—	—	—
„ 29	"Cruiser"	—	Portsmouth	15	175	—	—	—
„ 29	"Fortunata"	102	Tunis	10	11	—	—	—
„ 30	"Agia Matronia"	230	Constantinople	5	9	—	—	—
„ 30	"Callispe"	234	„	5	10	—	—	—
„ 30	"George Mills"	332	Cardiff	15	11	—	—	—
„ 30	"Addolorata"	32	Catona	7	12	—	—	—
„ 30	"S.M. di P.S.	52	Vietri	8	7	—	—	—
„ 30	"Isiris"	916	Alexandria	2	34	7	15	—
October 1	"Massilia"	1,308	Marseilles	1	106	11	14	—
„ 1	"L'Asie"	477	„	8	39	1	15	—
„ 1	"Sultan Orkham"	—	Greenock	2	160	—	—	—
„ 1	"Fanny Lambert"	536	Constantinople	2	21	—	—	—
„ 2	"Milan"	736	Smyrna	1	31	3	8	—
„ 2	"Mary Ann Webb"	333	Cardiff	15	14	—	—	—
„ 2	"Sahara"	1,073	Liverpool	1	36	—	—	—
„ 2	"Francesco Luca"	324	Constantinople	1	15	—	—	—
„ 2	"Cephalonia"	318	„	5	13	—	—	—
„ 3	"Asia"	923	Odessa	2	39	—	—	—
„ 3	"Sidon"	1,267	Liverpool	4	55	—	—	—
„ 3	"Euphemia Fullarton."	165	Licata	15	9	—	—	—
„ 3	"Regina Vittoria"	97	Constantinople	5	10	—	—	—
„ 3	"Sovrano"	296	„	5	14	—	—	—
„ 3	"Urano"	180	„	5	10	—	—	—
„ 4	"Veloce"	14	Perranova	3	8	4	19	—
„ 4	"Leonilda"	17	Pozzallo	4	7	—	—	—
„ 4	"Chevalier Rose"	107	Tunis	6	5	7	10	—
„ 4	"Stella"	10	Marsamemi	21	6	—	—	—
„ 5	"Due Maine"	163	Constantinople	5	9	—	—	—
„ 5	"M. di P.S."	39	Pozzallo	8	8	—	—	—
„ 6	"Addolorata"	12	Terranova	7	6	—	—	—
„ 6	"Emmanuela"	14	„	6	5	—	—	—
„ 6	"Atlantic"	1,111	Liverpool	1	35	—	—	—
„ 6	"Ripon"	1,308	Southampton	1	110	11	15	—
„ 6	"S. S. Crocifisso"	27	Terranoxa	6	6	—	—	—
„ 6	"S. Maria"	15	Mazzara	7	5	—	—	—
„ 6	"Vincenzino"	22	Girgenti	7	5	1	15	—
„ 6	"Agregentina"	17	Pantalleria	13	6	—	—	—
„ 6	"Rosina"	19	Girgenti	7	8	—	—	—
„ 6	"S. Catello"	17	Siculiana	7	6	—	—	—
„ 6	"Immacolata"	15	Scoglietti	7	8	—	—	—
„ 6	"S. Liberata"	18	„	7	9	—	—	—
„ 6	"S. Alberto"	19	Trapani	15	5	—	—	—
„ 6	"Flora"	51	Castellamare	15	7	—	—	—
„ 6	"Speranza"	270	Cardiff	5	10	—	—	—
„ 6	"Nina"	80	Riposto	3	10	—	—	—
„ 6	"Madella Consolazione."	32	Girgenti	7	6	—	—	—
„ 6	"Aurora"	18	Scoglietti	6	5	—	—	—
„ 6	"Carmela"	100	Tunis	10	9	—	—	—
„ 6	"Peppino Liardo"	24	Terranova	4	5	—	—	—
„ 7	"Semiramis"	330	Newport	15	11	—	—	—
„ 7	"Maria Carmela"	81	Catania	21	7	—	—	—
„ 7	"Immacolata"	33	Licata	6	7	—	—	—
„ 7	"Onwards"	188	Girgenti	21	9	—	—	—
„ 7	"S. Giuseppe"	29	Messina	21	9	—	—	—
„ 7	"Norfolk Hero"	157	Smyrna	5	7	—	—	—
„ 7	"Angelina"	40	Trapani	21	7	—	—	—
„ 7	"Grecian"	1,555	Smyrna	2	38	—	—	—
„ 7	"Pera"	1,373	Marseilles	1	125	14	15	—
„ 7	"S. Giuseppe"	31	Trapani	21	7	—	—	—
„ 7	"S. Giuseppe"	35	Catona	12	10	—	—	—
„ 8	"Addolorata"	23	Pozzallo	6	8	—	—	—
„ 7	"Lady Pirie"	359	Constantinople	15	11	—	—	—
„ 7	"Porto Salvo"	308	„ „	5	14	—	—	—
„ 7	"S. M. di P. S."	39	Cotrone	15	11	—	—	—
„ 8	"Fortunata"	33	Scoglietti	5	7	1	17	—
„ 8	"Nuovo Giacinto"	39	Pozzallo	12	8	—	—	—
„ 7	"S. Gaetano"	8	Augusta	7	8	—	—	—
„ 7	"M. del Soccorso"	8	Sciacca	14	5	—	—	—
„ 7	"S. Giuseppe	26	Pozzallo	8	8	—	—	—
„ 8	"Union"	80	Plymouth	4	12	—	—	—
„ 8	"Arabian"	1,695	Alexandria	2	40	1	15	—
„ 8	"S. Giovanni"	25	Trapani	21	6	—	—	—
„ 9	"Demetrius"	418	Liverpool	1	26	—	—	—
„ 9	"Napoli"	303	Syracuse	1	36	—	—	—
„ 9	"Tertius"	357	Constantinople	5	13	—	—	—
„ 9	"Agricola"	278	„ „ „	5	10	—	—	—
„ 9	"Junon"	649	Marseilles	3	38	3	15	—
„ 9	"Delta"	1,308	Alexandria	1	108	5	15	—
„ 9	"Mary"	210	Constantinople	5	10	—	—	—
„ 9	"Bechir"	—	Tunis	5	83	—	—	—

Table XXVII.—Return of the Vessels, Crews, and Passengers arriving in Quarantine, &c.—*continued.*

Date of Arrival.	Name of Vessel.	Tonnage.	From whence.	Number of Days in "Quarantine."	Number of Crew.	Passengers Landed in the "Lazzaretto,"		Remarks. Cases of Cholera or Diarrhœa, &c.
						Number.	Days in "Quarantine."	
1866.								
October 9	"Massilia"	1,308	Alexandria	2	105	6	15	—
,, 9	"Gustave Pastor"	612	Constantinople	2	22	—	—	—
,, 10	"S. Filomena"	295	,, ,,	9	13	—	—	—
,, 10	"Giovanni Avieino"	281	,, ,,	5	12	—	—	—
,, 10	"Giovanna"	169	Dardanells	2	8	—	—	—
,, 10	"Sesostris"	1,607	Alexandria	2	44	1	15	—
,, 10	"Roma"	508	Tunis	3	20	13	10	—
,, 11	"Behera"	1,142	Alexandria	1	38	—	—	—
,, 11	"Sicilian"	1,014	Liverpool	1	38	—	—	—
,, 11	"S. Antonio di Padova."	38	Siderus	7	11	—	—	—
,, 11	"Reshid"	132	Constantinople	15	10	—	—	—
,, 11	"Orontes"	538	Liverpool	1	30	—	—	—
,, 12	"William III,"	533	Texel	2	26	—	—	—
,, 12	"Pennyslvania"	—	Belfast	4	97	24th Regiment	15	—
,, 12	"Enrichetta"	278	Constantinople	5	12	—	—	—
,, 13	"La Luna"	88	Castellamare	15	8	—	—	—
,, 13	"Tanjore"	2,100	Southampton	1	122	24	15	—
,, 13	"Cerere"	269	Constantinople	4	13	—	—	—
,, 13	"Giuseppe Sgiuppa"	542	,, ,,	2	16	—	—	—
,, 13	"Gyptis"	613	Alexandria	2	37	9	15	—
,, 14	"S. Maria"	19	Palermo	21	6	—	—	—
,, 14	"Mari Valians"	298	Constantinople	5	12	—	—	—
,, 15	"Ceylon"	1,365	Marseilles	1	123	17	15	—
,, 15	"O'Spiros"	188	Constantinople	13	9	—	—	—
,, 15	"La Dacia"	173	Follonica	7	10	—	—	—
,, 15	"Assidua"	484	Constantinople	5	14	—	—	—
,, 15	"Ornarodd"	250	,, ,,	9	9	—	—	—
,, 15	"Lybia"	1,044	Liverpool	1	34	—	—	—
,, 15	"Laconia"	782	Smyrna	3	37	19	5	—
,, 15	"Oliva"	53	Tunis	10	6	—	—	—
,, 16	"Leone"	367	Syracuse	1	37	5	21	—
,, 16	"Marietta"	347	Constantinople	12	11	—	—	—
,, 16	"Rebah"	56	Leghorn	7	9	—	—	—
,, 16	"Isis"	1,436	Cardiff	1	44	1	12	—
,, 16	"Giuseppa"	19	Mazzana	15	7	—	—	—
,, 16	"Hellenis"	503	London	2	28	21	12	—
,, 17	"Lema"	670	Constantinople	2	23	—	—	—
,, 17	"Pera"	1,373	Alexandria	2	125	—	—	—
,, 17	"Nachimoff"	1,563	London	3	50	—	—	—
,, 17	"Pallio"	149	Constantinople	5	7	—	—	—
,, 17	"Ma. del Carmine"	38	Bagnara	7	8	—	—	—
,, 17	"S. Helena"	15	,,	7	8	—	—	—
,, 17	"Fascolo"	486	Constantinople	5	14	—	—	—
,, 17	"Calatafini"	44	Syracuse	21	7	—	—	—
,, 17	[illegible]	29	Pizzallo	9	8	—	—	—
,, 17	"Roberto[illegible]"	48	[illegible]	15	8	—	—	—
,, 17	"Ma. della Libera"	12	Syracuse	15	8	—	—	—
,, 17	"Porto Salvo"	96	,,	5	14	—	—	—
,, 17	"Sveti Vid"	501	Constantinople	11	6	—	—	—
,, 17	"S. Michele"	65	,,	1	110	—	—	—
,, 17	"Ripon"	1,308	Alexandria	4	110	—	—	—
,, 18	"Peppino Liardo"	23	Avola	4	5	—	—	—
,, 18	"Egyptien"	374	Marseilles	1	35	4	15	—
,, 18	"Possochoff"	452	London	3	25	—	—	—
,, 18	"S. Liberata"	24	Terranova	4	6	—	—	—
,, 18	"Ma. d'Alemagna"	18	,,	21	6	—	—	—
,, 18	"Eva"	92	Follonica	7	6	—	—	—
,, 18	"Emmanuele"	27	Catona	7	8	—	—	—
,, 18	"Chevalier Rose"	107	Tunis	13	15	15	3	—
,, 19	"Animedel Purgatino."	63	Salerno	15	7	—	—	—
,, 19	"Arcadia"	740	Liverpool	3	38	8	16	—
,, 19	"Persian"	1,671	Alexandria	2	39	—	—	—
,, 20	"Marietta"	29	Trapani	11	8	—	—	—
,, 20	"Cannella Angiolini"	30	Terrananova	6	6	—	—	—
,, 20	"Hydra"	—	Capo Passaro	6	105	—	—	—
,, 20	"Mansour"	—	Tunis	5	74	—	—	—
,, 20	"Ma. delle Grazie"	33	Catona	7	10	—	—	—
,, 20	"Ninetta"	26	Trapani	11	5	—	—	—
,, 20	"Evangelistria"	247	Constantinople	5	10	—	—	—
,, 20	"S. Francesco"	75	Galipoli	15	8	—	—	—
,, 20	"Selem"	35	Alexandria	10	8	—	—	—
,, 20	"Aurora"	17	Scoglietti	6	6	—	—	—
,, 20	"Christina"	692	Alexandria	2	32	—	—	—
,, 20	"Taxiarchi"	111	Constantinople	10	7	—	—	—
,, 21	"Sacra Sposa"	29	Catona	7	8	—	—	—
,, 21	"Olympus"	1,219	Trieste	3	57	—	—	—
,, 21	"Patriarche"	166	Oran	15	9	—	—	—
,, 21	"Marietta"	218	Constantinople	5	11	—	—	—
,, 21	"Gottoms, M."	509	,,	5	14	—	—	—
,, 21	"Syria"	1,308	Southampton	2	111	2	10	—
,, 21	"Salomon"	78	London	6	15	—	—	—
,, 22	"Ma. di Liesse"	16	Scoglietti	21	8	—	—	—
,, 22	"Ma. di Loreto"	20	,,	21	8	—	—	—
22	"Gianima"	13	,,	21	9	—	—	—

Table XXVII.—Return of the Vessels, Crews, and Passengers arriving in Quarantine, &c.—*continued.*

Date of Arrival.	Name of Vessel.	Tonnage.	From whence.	Number of Days in "Quarantine."	Number of Crew.	Passengers Landed in the "Lazzaretto."		Remarks. Cases of Cholera or Diarrhœa, &c.
						Number.	Days in "Quarantine."	
1866.								
October 22	"Fortunato"	33	Scogliette	7	6	—	—	—
„ 22	"Nicola"	257	Constantinople	5	9	—	—	—
„ 22	"S. Fco. di Paola"	33	Scilla	7	9	—	—	—
„ 22	"S. M. di P. S."	26	S. Lucido	7	8	—	—	—
„ 22	"Frederico B."	268	Constantinople	2	14	—	—	—
„ 22	"Fausta"	142	„	6	7	—	—	—
„ 22	"S. Fco. di Paola"	26	S. Lucido	7	5	—	—	—
„ 22	"Giovanni"	467	Cette	4	13	—	—	—
„ 22	"Luisa"	59	Amantea	7	9	—	—	—
„ 22	"S. Vincenzo"	65	Castellamare	15	10	—	—	—
„ 22	"Morocco"	1,267	Alexandria	3	57	—	—	—
„ 22	"S. Filomena"	11	Paola	7	7	—	—	—
„ 23	"Salvatore"	38	Catania	21	9	—	—	—
„ 23	"Napoli"	303	Syracuse	1	35	—	—	—
„ 23	"Delta"	1,308	Marseilles	1	107	6	15	—
„ 24	"Orixa"	345	Constantinople	4	11	—	—	—
„ 24	"Maria"	19	Pozzallo	6	7	—	—	—
„ 24	"Addolorata"	23	„	6	7	—	—	—
„ 24	"S. Martino"	11	Sampieri	8	6	—	—	—
„ 24	"Alessio"	107	S. Jean d'Acre	2	8	—	—	—
„ 25	"Ceylon"	1,365	Alexandria	1	123	—	—	—
„ 25	"Tanjore"	2,100	„	1	125	5	10	—
„ 25	"Angeliki"	304	Constantinople	3	10	—	—	—
„ 26	"Issignur"	161	Alexandria	10	10	—	—	—
„ 26	"Ticonderoga"	—	„	1	230	—	—	—
„ 26	"Salvara"	1,073	„	2	36	—	—	—
„ 26	"Danube"	942	Liverpool	3	34	—	—	—
„ 27	"Jaffaria"	—	Southampton	2	54	—	—	—
„ 27	"Thebes"	1,667	Alexandria	3	43	1	10	—
„ 28	"China"	1,340	Southampton	2	124	6	10	—
„ 29	"Adalia"	1,022	Liverpool	1	33	—	—	—
„ 29	"Ponsonby"	135	Talamone	7	9	—	—	—
„ 29	"Atlas"	672	Constantinople	1	25	—	—	—
„ 29	"Peppino Liardo"	23	Avola	9	5	—	—	—
„ 30	"Rosetta"	681	Cardiff	1	28	—	—	—
„ 30	"Ma. delle Grazie"	27	Terranova	6	7	—	—	—
„ 30	"Immacolata"	34	Marsala	21	9	—	—	—
„ 30	"Diligente"	121	Cette	11	6	—	—	—
„ 30	"Napoli"	303	Syracuse	1	34	2	21	—
„ 30	"Horoscope"	108	Nice	11	7	—	—	—
„ 30	"S. Alberto"	18	Bona	3	5	—	—	—
„ 30	"Spirito Santo"	96	„	11	10	—	—	—
„ 30	"N. Siga. di Loreto"	65	Girgenti	21	6	—	—	—
„ 30	"S. S. Crocifisso"	52	Pozzallo	19	9	—	—	—
„ 30	"S. Giovanni"	21	„	5	8	—	—	—
„ 30	"Sarah Ann"	276	Shoreham	5	10	—	—	—
„ 30	"Demetrius"	418	Alexandria	2	23	—	—	—
„ 30	"Cosmopolita"	148	Swansea	10	9	—	—	—
„ 30	"Teseo"	168	Marseilles	15	10	—	—	—
„ 30	"Ripon"	1,308	„	2	110	19	10	—
„ 31	"Nicolino"	291	„	14	11	—	—	—
„ 31	"Molly Boun"	155	Girgenti	4	7	—	—	—
„ 31	"Roberto"	29	Pozzallo	6	9	—	—	—
„ 31	"S. Barbara"	16	Mazara	8	5	—	—	—
„ 31	"Parana"	1,025	London	4	36	2	10	—
„ 31	"Milan"	736	Liverpool	1	29	2	10	—
November 1	"Atlantic"	1,111	Alexandria	1	36	1	8	—
October 31	"Angiolina"	36	Marsala	7	6	—	—	—
„ 31	"Immacolata"	43	Girgenti	7	7	—	—	—
„ 31	"Angelo Custode"	14	Terranova	4	6	—	—	—
„ 31	"S. S. Crocifisso"	20	„	4	7	—	—	—
„ 31	"S. Catello"	19	Girgenti	7	6	—	—	—
„ 31	"Rosina"	19	„	7	6	—	—	—
„ 31	"Ma. del Carmine"	14	„	7	4	—	—	—
„ 31	"S. Antonio"	14	Terranova	4	6	—	—	—
November 1	"Ma. della Consolazione."	31	Girgente	6	6	—	—	—
„ 1	"Anna"	33	„	9	7	—	—	—
„ 1	"L'Asie"	477	Alexandria	2	40	36	7	—
„ 1	"Atlas"	1,219	Liverpool	3	55	—	—	—
„ 1	"Clemence"	120	Mustgamene	9	7	—	—	—
„ 1	"S. Antonio"	33	Catanzaro	7	8	—	—	—
„ —	"Ma. delle Grazie"	31	Syracuse	21	6	—	—	—
„ 2	"Ma. del Carmine"	45	Puzzuoli	15	8	—	—	—
„ 2	"Ceres"	—	Liverpool	9	19	—	—	—
„ 2	"Delta"	1,308	Alexandria	1	107	—	—	—
„ 2	"Syria"	1,308	„	1	111	—	—	—
„ 2	"Salvatore"	34	Gallipoli	7	11	—	—	—
„ 2	"Luisella Romano"	38	Messina	20	6	—	—	—
„ 2	"S. Fco. di Paolo"	22	Augusta	21	8	—	—	—
„ 2	"Helga"	160	Constantinople	3	8	—	—	—
„ 2	"Dominico"	28	Syracuse	21	7	—	—	—
„ 2	"Cattolica"	31	Catona	7	11	—	—	—
„ 3	"Ma. delle Grazie"	15	Scogliette	5	8	—	—	—
„ 3	"S. Vittorio"	29	Augusta	21	9	—	—	—
„ 3	"Italian"	1,500	Alexandria	1	37	—	—	—

TABLE XXVII.—Return of the Vessels, Crews, and Passengers arriving in Quarantine, &c.—*continued.*

Date of Arrival.	Name of Vessel.	Tonnage.	From whence.	Number of Days in "Quarantine."	Number of Crew.	Passengers Landed in the "Lazzaretto."		REMARKS. Cases of Cholera or Diarrhœa, &c.
						Number.	Days in "Quarantine."	
1866.								
November 3	"Caroline"	891	Constantinople	3	34	—	—	—
„ 3	"S. S. Crocifisso"	27	Terranova	4	7	—	—	—
„ 3	"Corcyra"	627	London	6	36	1	6	—
„ 3	"Thessalia"	794	Liverpool	3	37	1	9	—
„ 4	"S. Liberata"	18	Scoglietti	5	9	—	—	—
„ 4	"Maraition"	1,213	Alexandria	2	57	2	5	—
„ 4	"Admiral Blake"	146	Milford	5	7	—	—	—
„ 5	"Rhone"	943	Cardiff	1	31	—	—	—
„ 4	"Consolazione"	14	Terranova	3	7	—	—	—
„ 4	"Emmanuela"	16	„	3	6	—	—	—
„ 4	"Veloce"	18	„	4	6	—	—	—
„ 4	"Caroline"	179	Dahouet	5	8	—	—	—
„ 5	"Redentore"	17	Girgenti	4	6	—	—	—
„ 5	"Gela"	15	Terranova	2	6	—	—	—
„ 5	"Immacolata"	15	Scoglietti	21	8	—	—	—
„ 5	"Giuseppina"	32	Pantalleria	5	7	—	—	—
„ 5	"S. Paolo"	29	„	5	8	—	—	—
„ 5	"Ma. del Carmine"	45	Girgenti	4	8	—	—	—
„ 5	"S. Vinzo. Ferreri"	25	„	21	7	—	—	—
„ 5	"Dunholme"	359	Cardiff	5	11	—	—	—
„ 5	"Celsus"	298	Milford	5	10	—	—	—
„ 5	"Ma. Addolorata"	54	Girgente	21	8	—	—	—
„ 5	"General Chasse"	541	Milford	5	17	—	—	—
„ 5	"Ma. del Soccorso"	8	Scicca	2	5	—	—	—
„ 5	"Patriott"	186	Follonica	7	7	—	—	—
„ 5	"Poonah"	1,308	Southampton	2	126	6	5	—
„ 6	"Komiloff"	343	London	1	36	—	—	—
„ 6	"Ellettrico"	1,267	Syracuse	1	57	5	21	—
„ 6	"Antonino"	66	Marsala	21	8	3	10	—
„ 6	"Agnes"	199	London	10	8	—	—	—
„ 6	"S. Giovanni"	49	Trapani	4	6	—	—	—
„ 6	"Donna Maria"	131	Swansea	5	7	—	—	—
„ 6	"Salvatore"	18	Terranova	3	6	—	—	—
„ 7	"China"	1,340	Alexandria	1	124	2	5	—
„ 7	"Egyptien"	347	„	2	36	33	5	—
„ 7	"G. M. G."	39	Trapani	3	7	—	—	—
„ 7	"Megæra"	—	Devonport	5	168	—	—	—
„ 7	"Emmanuele"	13	Terranova	2	5	—	—	—
„ 7	"S. Liberata"	24	„	7	6	—	—	—
„ 7	"Isis"	1,400	Alexandria	1	43	—	—	—
„ 7	"Ripon"	1,308	„	1	110	4	5	—
„ 7	"Tanjore"	2,100	Marseilles	2	123	10	6	—
„ 8	"Euxene"	613	„	2	39	9	5	—
„ 8	"Admiral Kanaris"	764	Constantinople	2	25	9	5	—
„ 8	"Arcadia"	740	Alexandria	2	38	—	—	—
„ 8	"Lybia"	1,044	„	1	34	—	—	—
„ 8	"Crimean"	1,002	Cardiff	4	33	—	—	—
„ 7	"Fortunato"	38	Trapani	11	6	—	—	—
„ 7	"Ma. di Trapani"	20	Terranova	21	6	—	—	—
„ 7	"S. M. di P. S."	38	Pozzallo	4	9	—	—	—
„ 7	"Leonilda"	17	„	8	8	—	—	—
„ 7	"Addolorata"	23	„	11	9	—	—	—
„ 7	"Linda Florida"	363	Liverpool	10	12	—	—	—
„ 7	"S. S. Annunziata"	35	Paola	7	8	—	—	—
„ 7	"Addolorata"	12	Scoglietti	7	6	—	—	—
„ 7	"Ma. delle Grazie"	11	Aci Reale	2	6	—	—	—
„ 7	"S. Vincenzo"	47	Castellamare	15	8	—	—	—
„ 7	"S. Giovanni"	21	Pozzallo	8	8	—	—	—
„ 7	"S. Antonio"	26	S. Lucido	7	11	—	—	—
„ 7	"S. Gio Batta"	41	Paola	7	12	—	—	—
„ 8	"Brothers"	292	Sunderland	5	9	—	—	—
„ 8	"Estra"	99	Gallipoli	5	5	—	—	—
„ 8	"Saida"	1,109	Liverpool	2	33	—	—	—
„ 11	"Jane Frances"	346	London	7	10	—	—	—
„ 11	"Concetta Immacolata."	17	Scoglietti	13	9	—	—	—
„ 12	"S. Alberto"	18	Girgenti	12	6	—	—	—
„ 12	"Agia Sofia"	977	Liverpool	2	39	—	—	—
„ 12	"Confidence"	279	Newport	5	9	—	—	—
„ 12	"Vittoria"	68	Marsala	21	8	—	—	—
„ 12	"G. M. G."	43	S. Lucido	7	9	—	—	—
„ 12	"S. Elena"	15	Borgnara	7	8	—	—	—
„ 12	"Catarina"	62	Marsala	21	10	—	—	—
„ 12	"Ma. della Cava"	72	„	21	10	—	—	—
„ 12	"Crimea"	42	Syracuse	21	7	—	—	—
„ 12	"S. Giuseppe"	42	Marsala	21	7	—	—	—
„ 12	"Filoppini"	222	Marseilles	3	9	—	—	—
„ 12	"Lady Briggs"	85	Marsala	21	9	—	—	—
„ 12	"Ma. delle Grazie"	30	Paola	7	8	—	—	—
„ 12	"S. Paolo"	37	Castellamare	15	7	—	—	—
„ 12	"Tour"	267	Newcastle	5	19	—	—	—
„ 13	"Dalmatian"	1,599	Alexandria	1	38	—	—	—
„ 13	"G. M. G."	42	Trapani	5	7	—	—	—
„ 13	"Archimede"	151	Syracuse	1	28	11	21	—
„ 13	"Maria Costanza"	122	S. Stefano	7	7	—	—	—
„ 13	"Massilia"	1,308	Southampton	9	108	5	5	—

TABLE XXVII.—Return of the Vessels, Crews, and Passengers arriving in Quarantine, &c.—*continued.*

Date of Arrival.	Name of Vessel.	Tonnage.	From whence.	Number of Days in "Quarantine."	Number of Crew.	Passengers Landed in the "Lazzaretto."		Remarks. Cases of Cholera or Diarrhœa, &c.
						Number.	Days in "Quarantine."	
1865.								
November 14	"L'Asie"	477	Marseilles	1	39	2	5	—
,, 14	"Immacolata"	84	Licata	10	7	—	—	—
,, 14	"Lilibeo"	41	Marsala	20	6	—	—	—
,, 14	"Syria"	1,308	Marseilles	2	111	11	5	—
,, 14	"Osiris"	916	Liverpool	2	34	—	—	—
,, 14	"Concetta"	27	Licata	10	7	1	12	—
,, 14	"Prospero Primo"	169	Palamone	7	8	—	—	—
,, 15	"Venetian"	1,025	Liverpool	1	37	—	—	—
,, 15	"S. Bartolo"	10	Lampedosa	2	4	—	—	—
,, 15	"Mozart"	261	Liverpool	10	10	—	—	—
,, 15	"Tanjore"	2,100	Alexandria	2	127	4	5	—
,, 16	"Blitz"	—	Algiers	5	63	—	—	—
,, 17	"Angelo Raffaele"	48	Vietri	8	8	—	—	—
,, 17	"Memnon"	927	Cardiff	1	33	—	—	—
,, 17	"Eugenio"	29	Girgenti	7	6	—	—	—
,, 18	"Giacomo"	146	Enos	10	10	—	—	—
,, 18	"Tripoli"	1,401	Naples	1	56	—	—	—
,, 19	"Psyche"	—	Alexandria	5	65	—	—	—
,, 19	"Marietta"	38	Naples	8	7	—	—	—
,, 19	"S. Catello"	19	Girgenti	13	7	—	—	—
,, 19	"Vincenzino"	21	,,	5	5	—	—	—
,, 20	"Ma. Crocifissa"	52	Pozzallo	5	9	—	—	—
,, 20	"Ma. della Consolazione."	31	Girgenti	12	6	1	10	—
,, 20	"Angiolina"	36	,,	12	6	—	—	—
,, 21	"Arabian"	1,650	Liverpool	3	39	—	—	—
,, 21	"Adalia"	1,022	Alexandria	1	23	—	—	—
,, 21	"Archimede"	151	Syracuse	1	28	3	21	—
,, 22	"Armonia"	36	Girgenti	11	7	—	—	—
,, 22	"S. Giovanni"	20	Pozzallo	10	8	—	—	—
,, 22	"Peppino Liardo"	23	Terranova	3	5	1	18	—
,, 22	"S. Pietro"	67	Syracuse	13	10	—	—	—
,, 22	"Sesostris"	1,564	Liverpool	2	44	—	—	—
,, 22	"Rosetta"	681	Alexandria	2	29	—	—	—
,, 22	"Providenza"	24	Girgenti	15	6	—	—	—
,, 22	"S. Barbara"	16	Mazzara	21	5	—	—	—
,, 22	"Addolorata"	12	Scoglietti	3	6	—	—	—
,, 23	"Zaira"	28	Pozzallo	9	7	—	—	—
,, 23	"S. Giovanni"	14	,,	9	7	—	—	—
,, 23	"Giojosa"	17	Mazzara	21	8	—	—	—
,, 23	"Roma"	15	Scoglietti	9	6	—	—	—
,, 23	"Massilia"	1,308	Alexandria	1	107	6	5	—
,, 23	"Syria"	1,308	,,	1	111	—	—	—
,, 23	"Idea"	70	S. Vincenzo	5	7	—	—	—
,, 23	"Milan"	736	Alexandria	1	39	—	—	—
,, 23	"Prudhoe Castle"	553	Constantinople	2	22	—	—	—
,, 23	"John Middleton"	525	,,	2	21	—	—	—
,, 23	"Behera"	1,142	Liverpool	2	33	—	—	—
,, 24	"Podesta"	300	Constantinople	10	12	—	—	—
,, 24	"S. Pietro Paolo"	16	Augusta	21	11	—	—	—
,, 25	"T. J. Gates"	202	Constantinople	10	[illegible]	—	—	—
,, 25	"Roberto"	29	Pozzallo	7	[illegible]	—	—	—
,, 25	"Chiarina"	136	Castiglione	5	[illegible]	—	—	—
,, 25	"Argo"	532	Liverpool	[illegible]	[illegible]	—	—	—
,, 25	"Marguerite"	188	Syracuse	[illegible]	[illegible]	—	—	—
,, 25	"Ma. della Cava"	22	Paulalleria	[illegible]	[illegible]	—	—	—
,, 25	"S. Vinzo. Ferreri"	18	,,	[illegible]	[illegible]	—	—	—
,, 25	"Egyptien"	1,640	Alexandria	2	[illegible]	—	—	—
,, 25	"Thessalia"	794	,,	2	[illegible]	—	—	—
,, 26	"Tonia"	943	,,	3	[illegible]	—	—	—
,, 26	"Orontes"	538	,,	2	[illegible]	—	—	—
,, 27	"Napoli"	313	Syracuse	2	[illegible]	—	—	—
,, 27	"Vigilant"	222	Girgenti	6	10	—	—	—
,, 27	"Alexandria"	239	Constantinople	5	9	1	8	—
,, 28	"Una"	1,006	London	5	33	—	—	—
,, 28	"Ma. del Carmine"	45	Girgenti	5	8	—	—	—
,, 28	"Redenton"	17	Sciacca	8	5	—	—	—
,, 29	"Syrian"	1,014	Liverpool	1	37	—	—	—
,, 29	"Palestine"	937	,,	3	53	9	5	—
,, 29	"Gedda"	185	Constantinople	10	8	—	—	—
,, 29	"Poonah"	1,308	Alexandria	1	126	—	—	—
,, 30	"Danube"	942	Smyrna	2	34	14	5	—
December 1	"Euxene"	613	Alexandria	1	40	66	5	—
,, 1	"Ernest Merk"	1,228	,,	2	29	—	—	—
,, 1	"Kedar"	1,212	,,	2	53	—	—	—
,, 1	"Anna Howitz"	340	Constantinople	7	13	—	—	—
,, 1	"Pera"	1,373	Alexandria	1	121	2	5	—
,, 1	"China"	1,340	,,	1	124	—	—	—
,, 2	"Rhone"	943	,,	1	31	—	—	—
,, 2	"Florida"	1,451	,,	2	37	—	—	—
,, 2	"S. Nicola"	30	Castellamare	5	8	—	—	—
,, 2	"Crimean"	1,002	Alexandria	2	23	—	—	—
,, 2	"S. Giuseppe"	26	Pozzallo	1	8	—	—	—
,, 3	"Heaton Hall"	516	Constantinople	2	20	—	—	—
,, 3	"S. Filomena"	46	Paola	5	10	—	—	—
,, 3	"Rosina"	49	Riposto	21	10	—	—	—

TABLE XXVII.—Return of the Vessels, Crews, and Passengers arriving in Quarantine, &c.—*continued.*

Date of Arrival.	Name of Vessel.	Tonnage.	From whence.	Number of Days in "Quarantine."	Number of Crew.	Passengers Landed in the "Lazzaretto."		REMARKS. Cases of Cholera or Diarrhœa, &c.
						Number.	Days in "Quarantine."	
1866.								
December 3	"Heath Park"	390	Palermo	21	12	—	—	—
„ 3	"Giacomina"	63	Trani	5	10	—	—	—
„ 3	"Fortunata"	33	Scoglietti	11	7	—	—	—
„ 3	"S. Gio. Batta"	11	Syracuse	21	7	—	—	—
„ 3	"Calatafini"	44	„	11	7	—	—	—
„ 4	"Europa"	1,208	Liverpool	1	66	—	—	—
„ 4	"Archimede"	151	Syracuse	1	26	—	—	—
„ 4	"Caradoc"	—	Constantinople	—	67	—	—	—
„ 4	"L'Asie"	477	Alexandria	2	40	14	5	—
„ 5	"Laconia"	782	Liverpool	1	37	2	5	—
„ 5	"Leonilda"	17	Pozzallo	4	7	—	—	—
„ 5	"Peppino Liardo	23	Avola	21	6	—	—	—
„ 5	"Ma. delle Grazie"	15	Scoglietti	21	9	—	—	—
„ 5	"Wignacourt"	324	Alexandria	5	14	—	—	—
„ 5	"Thebes"	1,667	Liverpool	1	39	—	—	—
„ 5	"Carlotta P."	333	Constantinople	5	9	—	—	—
„ 5	"Saida"	1,109	Alexandria	2	33	—	—	—
„ 6	"Tripoli"	1,401	„	1	56	—	—	—
„ 6	"Sahara"	1,073	Liverpool	2	33	—	—	—
„ 7	"Despatch"	147	Alexandria	5	11	—	—	—
„ 7	"Agatina"	62	Riposto	21	9	—	—	—
„ 7	"Maria Teresa"	59	„	21	10	—	—	—
„ 7	"Nina"	80	„	21	9	—	—	—
„ 7	"S. S. Crocifisso"	35	„	15	8	—	—	—
„ 7	"Cognate Apap"	575	Constantinople	5	17	—	—	—
„ 7	"Ceylon"	1,308	Alexandria	2	122	4	5	—
„ 7	"Francesco Paolo"	56	Riposto	19	8	—	—	—
„ 7	"Addolorata"	23	Pozzallo	7	9	—	—	—
„ 7	"Immacolata Concezione."	13	Terranova	21	5	—	—	—
„ 7	"Ma. del Soccorso"	8	Girgenti	15	5	—	—	—
„ 7	"Maria"	18	Pozallo	7	7	—	—	—
„ 7	"S. S. Crocifisso"	15	Scoglihtti	21	5	—	—	—
„ 7	"S. S. Annunziata"	14	Terranova	21	5	—	—	—
„ 7	"Ma. d'Alemagna"	16	„	15	6	3	8	—
„ 7	"Consolazione"	14	„	2	7	—	—	—
„ 7	"S. Antonio"	14	„	19	6	—	—	—
„ 7	"S. S. Crocifisso"	27	„	15	6	—	—	—
„ 8	"Veloce"	17	„	14	7	—	—	—
„ 8	"Concetta"	27	Licata	14	7	—	—	—
„ 8	"Ma. Crocifissa"	52	Pozzallo	6	9	—	—	—
„ 8	"Atlas"	1,219	Smyrna	2	55	—	—	—
„ 9	"Massilia"	1,308	Alexandria	1	107	4	5	—
„ 8	"Valletta"	42	Riposto	27	8	—	—	—
„ 9	"Ma. di Liesse"	16	Scoglietti	20	7	—	—	—
„ 9	"S. Liberata"	18	„	20	8	—	—	—
„ 9	"Giannina"	13	„	20	9	—	—	—
„ 9	"Ursola"	12	Gallico	5	6	—	—	—
„ 9	"Ma. delle Grazie"	43	[illegible]	5	10	—	—	—
„ 9	"Giuseppe"	18	[illegible]ani	16	6	—	—	—
„ 9	"S. Catello"	19	[illegible]enti	13	6	—	—	—
„ 9	"G. M. G."	31	[illegible]ani	14	7	—	—	—
„ 9	"S. Padre"	24	[illegible]	13	6	—	—	—
„ 9	"Marietta"	29	[illegible]re	5	7	—	—	—
„ 9	"Aurora"	66	[illegible]	6	8	—	—	—
„ 10	"Concetta Immacolata."	[illegible]	[illegible]	[illegible]	9	—	—	—
„ 10	"Salvatore"	34	[illegible]	5	8	—	—	—
„ 10	"Memnon"	927	[illegible]ndria	1	33	—	—	—
„ 10	"Venetian"	1,025	„	1	37	—	—	—
„ 11	"Marsala"	250	[illegible]yracuse	1	32	—	—	—
„ 10	"Superba"	19	Mazzara	19	8	—	—	—
„ 10	"Immacolata Concezione."	12	Catona	5	6	—	—	—
„ 10	"Costantino"	403	Messina	19	14	—	—	—
„ 10	"Ma. del Carmine"	15	Gallico	5	8	—	—	—
„ 10	"S. Angelo"	32	Mazzara	19	9	—	—	—
„ 10	"S. Elena"	15	Bagnara	5	8	—	—	—
„ 10	"G. M. G."	17	Favignana	14	6	—	—	—
„ 10	"Grazia"	72	Marsala	19	9	—	—	—
„ 10	"Annita Garibaldi"	25	„	19	6	—	—	—
„ 10	"Fortuna"	33	„	19	7	—	—	—
„ 10	"Ma. del Soccorso"	24	„	19	7	—	—	—
„ 10	"Agnes"	199	Licata	19	8	—	—	—
„ 10	"Vigna"	70	Marsala	19	9	—	—	—
„ 10	"Diego"	13	Favignana	14	5	—	—	—
„ 10	"S. Gio. Batta"	41	Paola	5	12	—	—	—
„ 11	"S. Bartolo"	10	Avola	2	4	—	—	—
„ 11	"Nuovo Giacinto"	39	Pozzallo	11	10	—	—	—
„ 11	"S. Giovanni"	14	„	6	8	—	—	—
„ 11	"Fratelli Flori"	414	Constantinople	5	15	—	—	—
„ 11	"Redentore"	17	Sciacca	11	8	—	—	—
„ 12	"S. Alfonzo"	10	„	10	6	—	—	—
„ 12	"Pyrus"	318	Constantinople	5	12	—	—	—
„ 12	"Chiavari"	489	„	5	14	—	—	—
[illegible]	"Brodrene"	414	„	5	16	—	—	—

TABLE XXVII.—Return of the Vessels, Crews, and Passengers arriving in Quarantine, &c.—*continued.*

Date of Arrival.	Name of Vessel.	Tonnage.	From whence.	Number of Days in "Quarantine."	Number of Crew.	Passengers Landed in the "Lazzaretto."		Remarks. Cases of Cholera or Diarrhœa, &c.
						Number.	Days in "Quarantine."	
1866.								
December 12 -	"Agia Sofia" -	977	Smyrna - - -	2	40	—	—	—
„ 12 -	"Ma. delle Grazie" -	11	Catona - - -	5	6	—	—	—
„ 13 -	"William Cory" -	1,323	Alexandria - -	1	28	—	—	—
„ 13 -	"S. Fco. di Paola" -	21	Sciacca - - -	16	5	—	—	—
„ 13 -	"Teresa" - - -	52	Riposto - - -	16	9	—	—	—
„ 14 -	"Consolazione" -	32	Girgenti - - -	8	7	—	—	—
„ 14 -	"Montezuma" -	619	London - - -	5	31	—	—	—
„ 15 -	"Sappho" - - -	895	Alexandria - -	2	25	—	—	—
„ 15 -	"Theban" - - -	436	„ - - -	2	20	—	—	—
„ 15 -	"Delta" - - -	1,308	„ - - -	2	110	—	—	—
„ 15 -	"Italian" - - -	1,500	Liverpool - -	3	39	1	5	—
„ 16 -	"Atlantic" - - -	1,111	„ - - -	1	34	—	—	—
„ 16 -	"Poonah" - - -	1,308	Alexandria - -	2	126	6	2	—
„ 18 -	"Corriere Siciliano"	248	Syracuse - - -	4	30	11	11	—
„ 18 -	"Ma. del Carmine" -	28	Bagnara - - -	5	9	—	—	—
„ 18 -	"La Luna" - - -	136	Messina - - -	3	10	—	—	—
„ 18 -	"S. Antonio" - - -	52	Salerno - - -	5	7	—	—	—
„ 20 -	"Arcadia" - - -	740	Liverpool - -	5	38	—	—	—
„ 20 -	"Isis" - - - -	1,400	„ - - -	3	43	4	5	—
„ 20 -	"S. Gio. Batta" -	287	Salonique - -	10	10	—	—	—
„ 19 -	"Casimiro C. - -	412	Constantinople - -	2	13	—	—	—
„ 20 -	"Admiral Blake" -	146	Enos - - -	10	7	—	—	—
„ 21 -	"Stromboli" - -	619	Liverpool - -	2	38	1	5	—
„ 21 -	"S. Giovanni" -	20	Pozzalo - - -	4	9	—	—	—
„ 21 -	"Marietta" - - -	154	Enos - - -	10	9	—	—	—
„ 22 -	"Hydra" - - -	—	Augusta - - -	21	106	—	—	—
„ 22 -	"Immacolata" -	15	Scoglietti - -	7	8	—	—	—
„ 22 -	"Ma. di Loreto" -	20	„ - - -	7	8	—	—	—
„ 22 -	"Demetrius" - -	418	Liverpool - -	1	23	—	—	—
„ 23 -	"Olga" - - - -	238	Salonique - -	10	12	—	—	—
„ 24 -	"Duero" - - -	204	Girgenti - - -	3	32	—	—	—
„ 24 -	"S. Maria" - - -	15	Trapani - - -	7	5	—	—	—
„ 24 -	"Giasone" - - -	127	Venice - - -	5	8	—	—	—
„ 24 -	"S. Francesco" -	75	Gallipoli - - -	15	8	—	—	—
„ 24 -	"Due Fratelli" -	81	Syracuse - - -	7	7	—	—	—
„ 24 -	"Tre Fratelli" -	50	Trapani - - -	7	7	—	—	—
„ 25 -	"Etna" - - - -	346	Syracuse - - -	1	36	2	7	—
„ 25 -	"S. Giuseppe Trovato."	42	Pozzallo - - -	7	9	—	—	—
„ 25 -	"S. Francesco di Sales."	29	Messina - - -	7	8	—	—	—
„ 25 -	"Due Cugini" - -	29	Riposto - - -	7	6	—	—	—
„ 25 -	"G. M. G." - -	37	S. Lucido - -	5	10	—	—	—
„ 26 -	"S. Pietro" - -	76	Riposto - - -	7	11	—	—	—
„ 26 -	"Peppino Sebastianello."	33	„ - - -	7	8	—	—	—
„ 26 -	"Concordia" - -	47	„ - - -	7	9	—	—	—
„ 27 -	"Milan" - - -	736	Liverpool - -	3	30	—	—	—
„ 27 -	"S. Giovanni" -	14	Pozzallo - - -	7	6	—	—	—
„ 28 -	"S. S. Crocifisso" -	20	Terranova - -	7	7	—	—	—
„ 28 -	"Ma. d'Alemagna" -	16	„ - - -	7	5	—	—	—
„ 28 -	"Addolorata" -	12	„ - - -	7	6	—	—	—
„ 28 -	"Angiolina" - -	15	„ - - -	7				
„ 28 -	"S. Antonio" - -	33	Catanzaro - -	5				
„ 28 -	"Assunta" - - -	60	Riposto - - -					
„ 28 -	"S. Ma. di P. S." -	39	Cotrone - - -					
„ 29 -	"Florence" - - -	747	Liverpool - -					
„ 29 -	"S. Vinzo. Ferreri"	18	Pantalleria - -	7				
„ 29 -	"Bella Rosa" - -	78	Riposto - - -	3				
„ 29 -	"Orontes" - - -	538	Liverpool - -	2				
„ 31 -	"Nuovo Giacinto" -	39	Pozzallo - - -	4				

Port Department, Malta,
8th June 1867.

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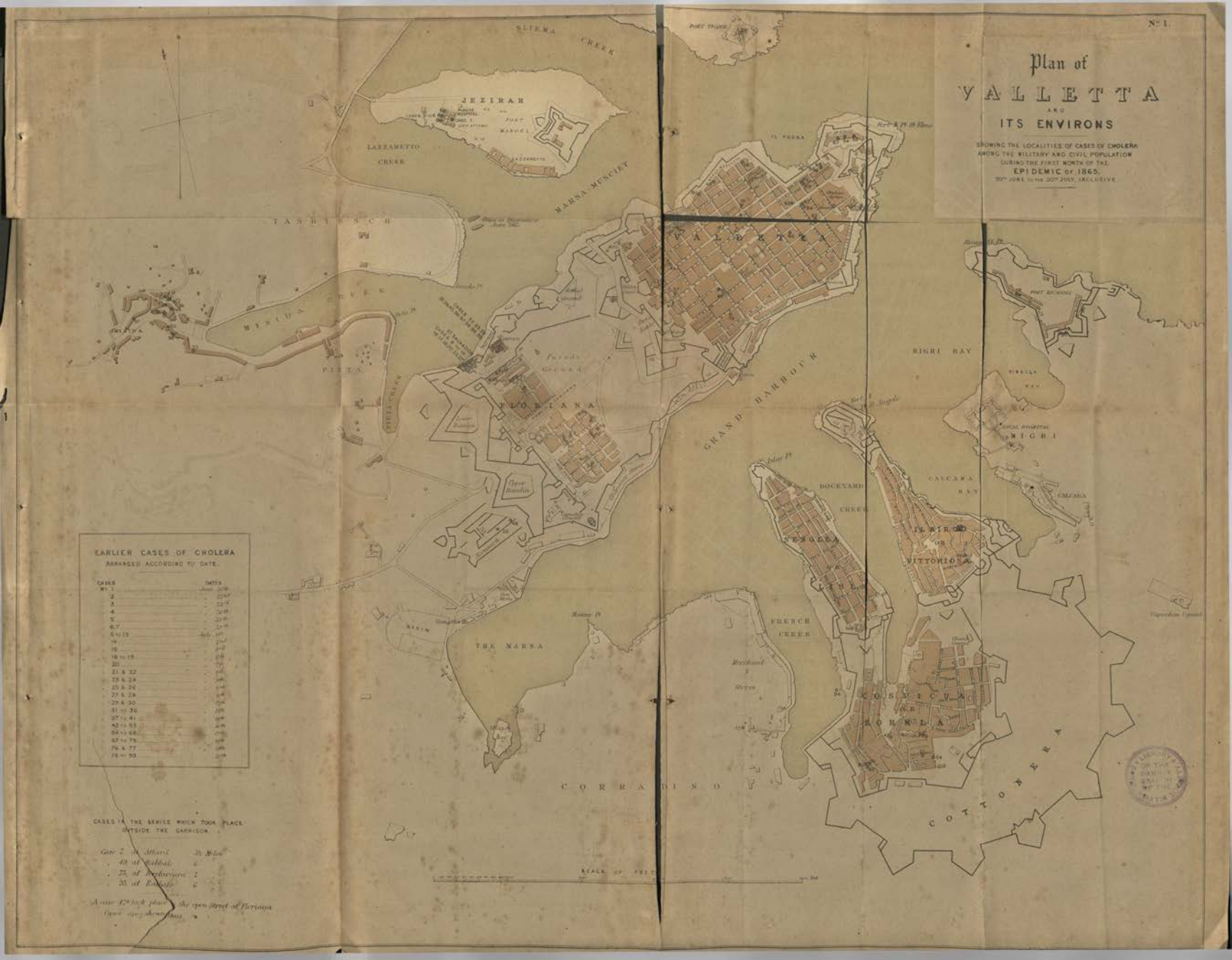
No 1.
Plan of
VALLETTA
AND
ITS ENVIRONS
SHOWING THE LOCALITIES OF CASES OF CHOLERA AMONG THE MILITARY AND CIVIL POPULATION DURING THE FIRST MONTH OF THE
EPIDEMIC OF 1865.
20th JUNE to the 20th JULY, INCLUSIVE
SLIEMA CREEK
JEZIRAH
FORT MANOEL
LAZZARETTO CREEK
MARSA MUSCIAT
TASBIA SCH
MSIDA CREEK
PIETA
FLORIANA
VALLETTA
GRAND HARBOUR
RIGHI BAY
RIGHI
CALCARA BAY
CALCARA
DOCKYARD CREEK
VITTORIOSA
FRENCH CREEK
THE MARSA
CORRADINO
COTTONERA
SCALE OF FEET
EARLIER CASES OF CHOLERA
ARRANGED ACCORDING TO DATE.
CASES
DATES
CASES IN THE SERIES WHICH TOOK PLACE OUTSIDE THE GARRISON.

No. II
Plan
OF THE
ISLANDS
OF
MALTA AND GOZO.
SHOWING THE SITES OF DEATHS FROM CHOLERA,
THE NUMBER OF DEATHS AND THE DATE OF FIRST AND LAST DEATHS
IN ALL THE VILLAGES DURING THE
EPIDEMIC OF 1865.
MEDITERRANEAN SEA
CHANNEL OF MALTA

Plan of
VALLETTA
AND
ITS ENVIRONS

SHOWING THE LOCALITIES OF DEATHS FROM CHOLERA AMONG THE MILITARY AND CIVIL POPULATION DURING THE EPIDEMIC OF 1865.

Military deaths are marked in red.
Civilian " " " black.

HOUSES GROUND FLOORS, CELLARS AND MEZZANINI IN VALLETTA WHICH WERE ATTACKED WITH PLAGUE DURING THE EPIDEMIC OF 1813

	CASES OF PLAGUE
STRADA *Del Genio*	3
—— —— *Marsamuscetto*	31
—— —— *Ponente*	8
—— —— *San Patrizio*	8
MANDERAGGIO	99
STRADA —— *Zecca*	6
—— " —— *San Carlo*	16
—— " —— *Toro*	7
—— " —— *Forni*	6
—— " —— *Stretta*	25
—— " —— *Fontana*	35
—— " —— *San Giuseppe*	55
—— " —— *Allesandro*	6
—— " —— *Reale*	51
—— " —— *Mercanti*	15
—— " —— *San Paolo*	60
—— " —— *Sant'Ursola*	86
—— " —— *Saluto*	55
—— " —— *Levante*	4
—— " —— *Pozzi*	52
—— " —— *Irlandese*	6
—— " —— *Brittanica*	30
—— " —— *San Giovanni*	12
—— " —— *Santa Lucia*	11
—— " —— *Teatro*	8
—— " —— *Vescovo*	37
—— " —— *Cristoforo*	11
—— " —— *San Michele*	4
—— " —— *Aquila*	2
—— " —— *San Domenico*	64
—— " —— *Sant Anna*	25
—— " —— *San Nicola*	117
—— " —— *Ospedale*	84
—— " —— *Tramontana*	30
—— " —— *Scaloni*	17
—— " —— *Fosse*	2
—— " —— *Santa Barbara*	2

The affected Dwellings are marked by black dots.

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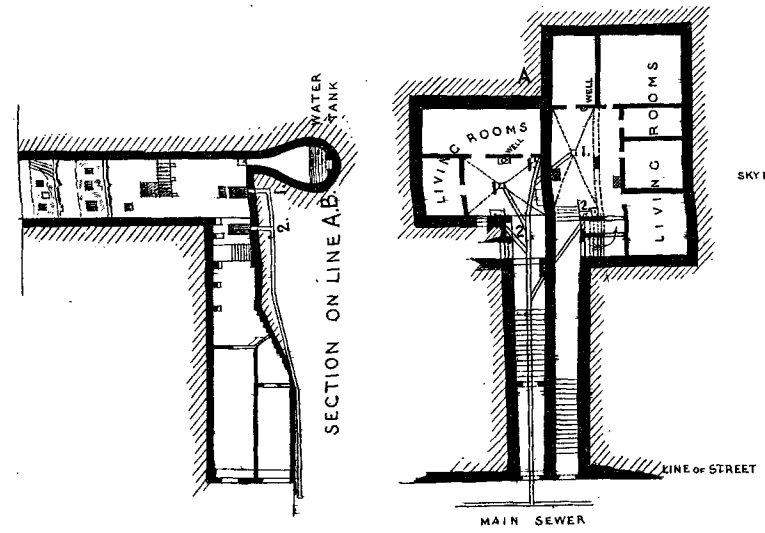
PLAN SECTION & ELEVATION
OF A

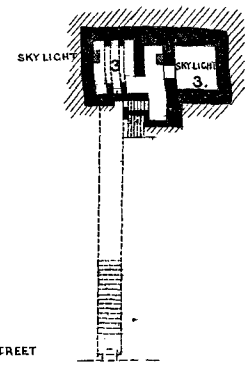
LODGING HOUSE

VALLETTA Sᵗᵃ LEVANTE.

Nº V.



GROUND PLAN



CELLAR.

FRONT ELEVATION.

1. UNTRAPPED SINKS
2. PRIVIES
3. MANURE ROOM

10 5 0 10 20 30 40 50 60 70 80 90 100 FEET

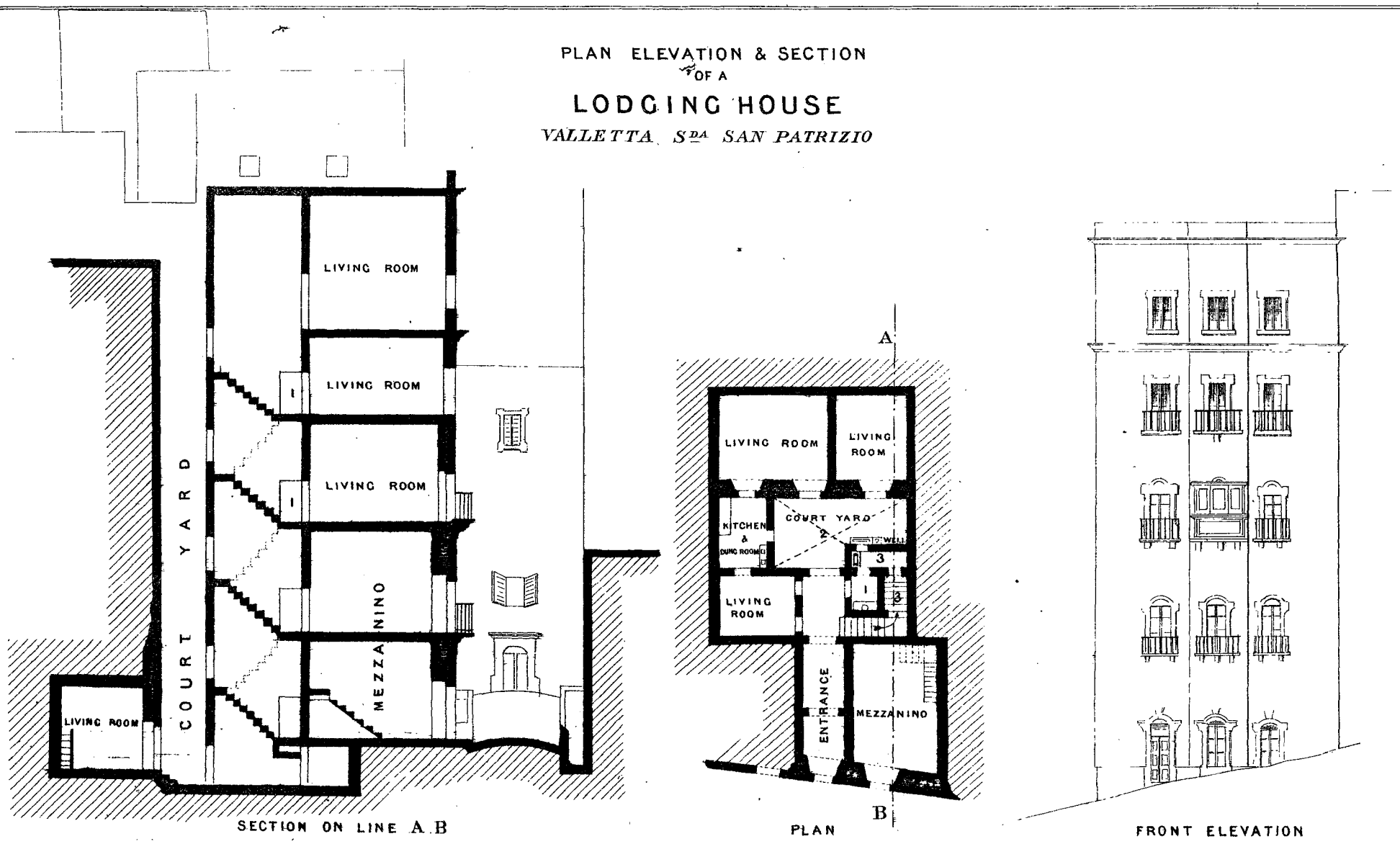
SCALE 40 FEET TO THE INCH.

Day & Son (Limited) Lith. London W.C.

Nº VI

PLAN ELEVATION & SECTION OF A LODGING HOUSE

VALLETTA S^DA SAN PATRIZIO



SECTION ON LINE A.B

PLAN

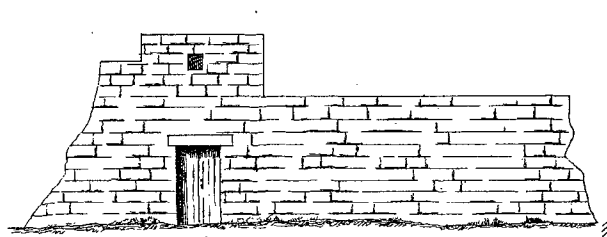
FRONT ELEVATION

1 PRIVY
2 SINK
3 MANURE ROOM

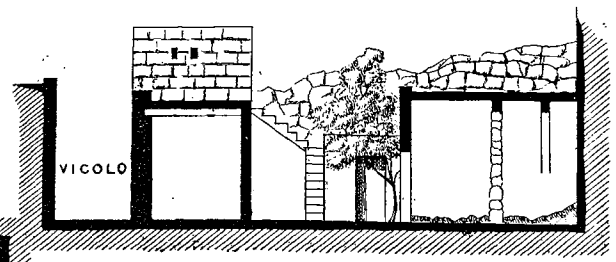
10 5 0 10 20 30 40 50 60 70 FEET

SCALE 20 FEET TO THE INCH

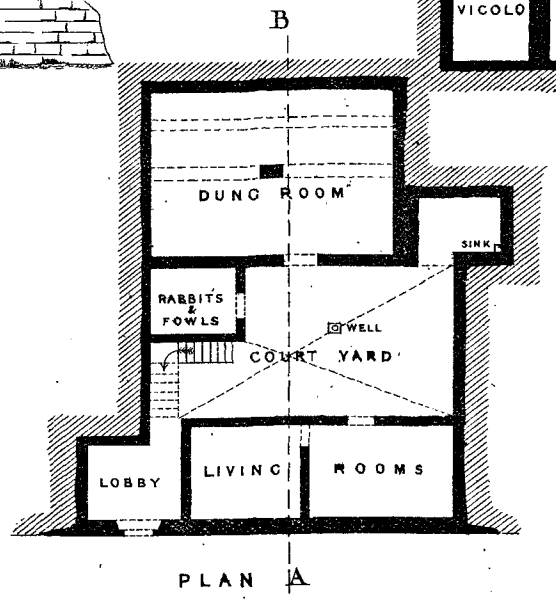
PLAN SECTION & ELEVATION OF HOUSE AT ZEITUN.



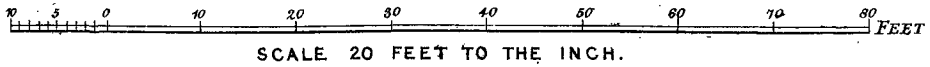
ELEVATION



SECTION ON LINE A.B.



PLAN



SCALE 20 FEET TO THE INCH.

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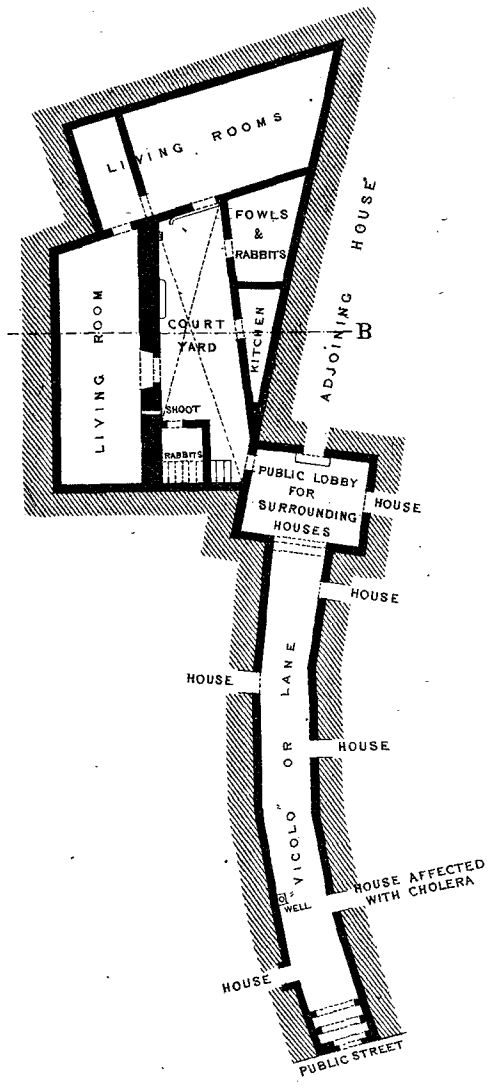
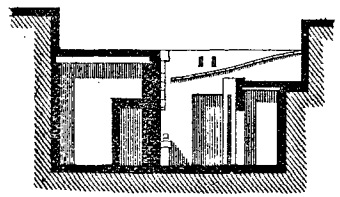
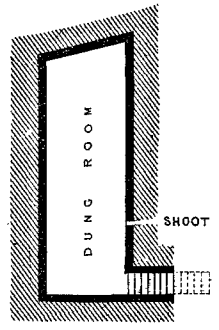
PLAN & SECTION
OF A
VILLAGE HOUSE
AT
CASAL ZEITUN.

N° VIII.





SECTION ON LINE AB.



CELLAR

10 6 0 10 20 30 40 50 60 70 FEET

SCALE 20 FEET TO THE INCH.

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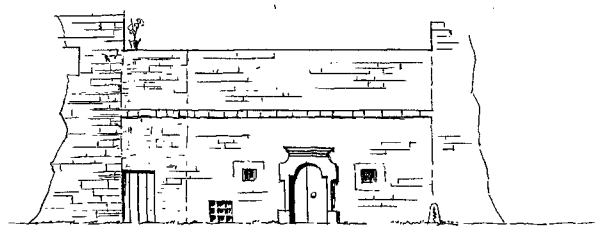
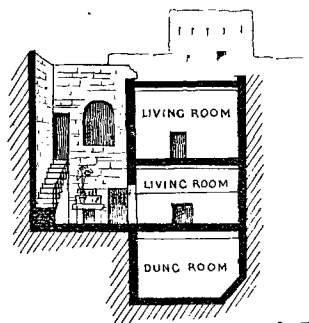
PLAN ELEVATION & SECTION.
OF A
VILLAGE HOUSE
AT CASAL ZEBBUG.

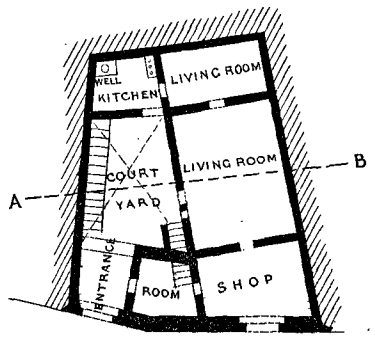
Nº IX.



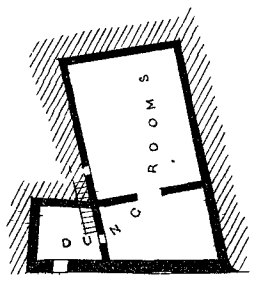
ELEVATION.



SECTION ON LINE A.B.



GROUND PLAN.



CELLAR

10 5 0 10 20 30 40 50 60 70 FEET

SCALE 20 FEET TO THE INCH.

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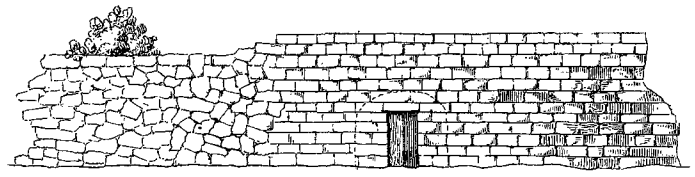
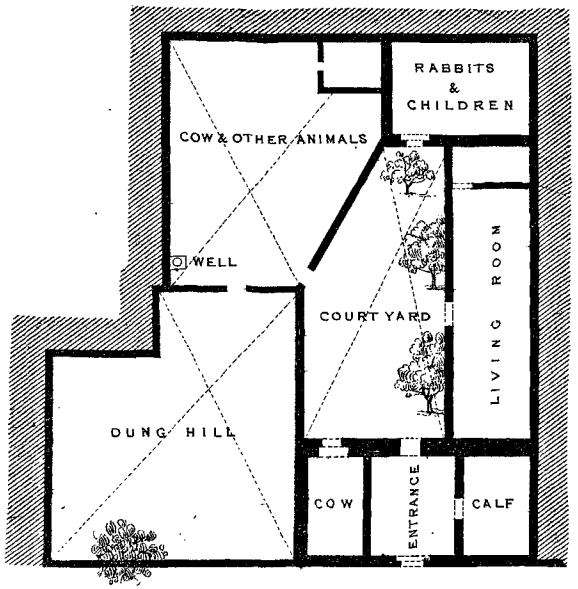
PLAN & ELEVATION
OF A
VILLAGE HOUSE
AT
CASAL ZEBBUG.

No. X.



ELEVATION



PLAN

10 5 0 10 20 30 40 50 60 70 FEET

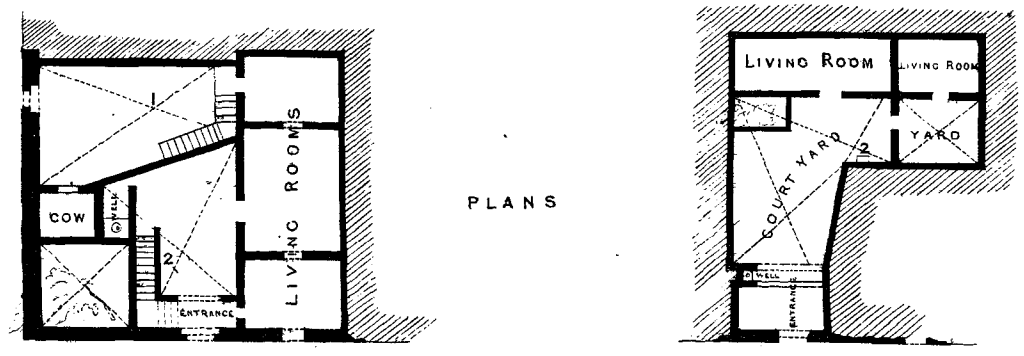
SCALE 20 FEET TO THE INCH

Day & Son, Limited lith.

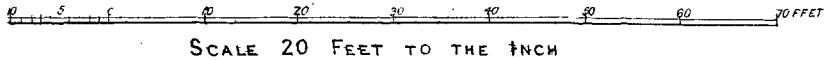
PLAN & ELEVATION
OF TWO
VILLAGE HOUSES
AT
CASAL CURMI

ELEVATIONS

1. UNTRAPPED SINK.
2. PRIVY & MANURE ROOM.



PLANS



SCALE 20 FEET TO THE INCH

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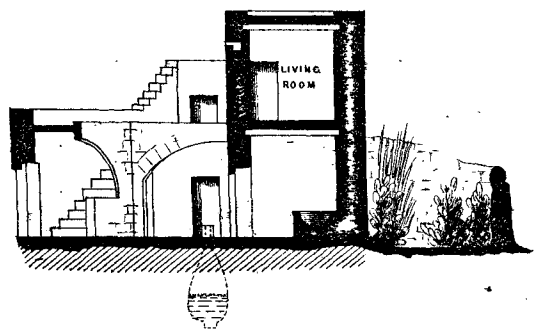
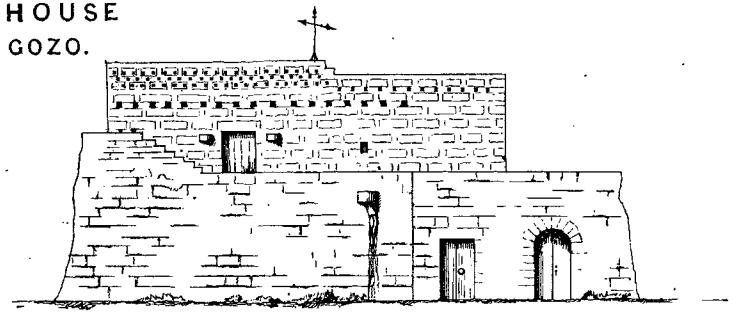
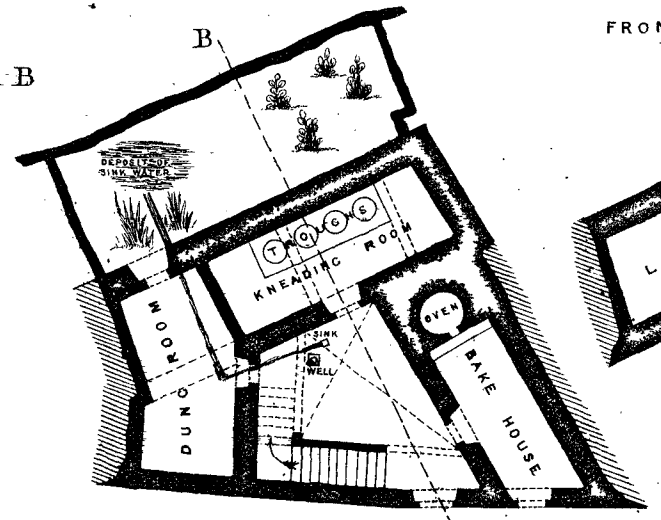
PLAN ELEVATION & SECTION OF A VILLAGE HOUSE AT "XEUCHIA" GOZO.



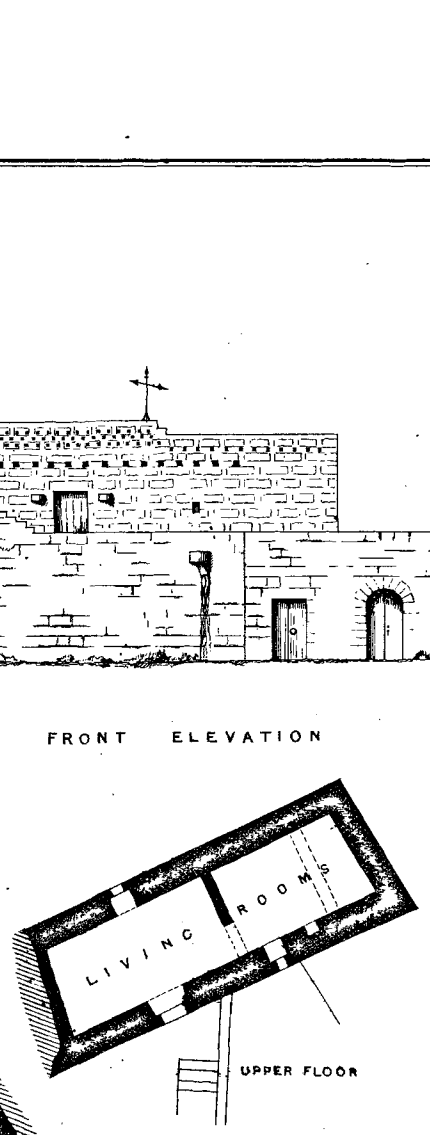
SECTION ON LINE A B

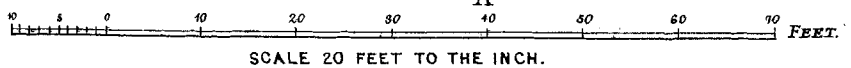


FRONT ELEVATION



GROUND FLOOR





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REPORT

OF A

SPECIAL COMMITTEE

ON

THE "GIBRALTAR" SHIELDS,

TOGETHER WITH THE

MINUTES OF EVIDENCE, &c.

Presented to both Houses of Parliament by Command of Her Majesty.

1868.

LONDON:

PRINTED BY HARRISON & SONS, FOR HER MAJESTY'S STATIONERY OFFICE.

1868.

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WAR OFFICE,
5th December, 1867.

Sir,

Gen. No. 5. 4574

I AM directed by Secretary Sir John Pakington to inform you that, in consequence of the Report made upon the Iron Shields for Land Defences sent to Gibraltar and Malta, he has considered it desirable that a Committee should be constituted to inquire into the following points, and he has appointed you, with the concurrence of the Lords Commissioners of the Admiralty, to be President, viz. :—

1st. How far the trials which have been made were unfavourable to the shield.
2nd. What were the causes which led to any failure in the shield.
3rd. What changes in the construction of such shields they would recommend.

The Members of the Committee will be as follows, subject to the approval of His Royal Highness the Field-Marshal Commanding-in-Chief, as regards the Military Officers; and Captain Harrison, R.A., Secretary to the late Committee on Iron Plates, will be the Secretary, viz. :—

Major-General Sir William Gordon, K.C.B., R.E.
Colonel Adye, C.B., R.A.
Lieutenant-Colonel E. W. Ward, R.E.
W. Fairbairn, Esq., F.R.S.
W. Pole, Esq., F.R.S.
Doctor Percy, F.R.S.

The Committee Room at this Office will be available for the Committee, and you will have the goodness to take the necessary steps for assembling it at an early date.

I have the honour to be,
SIR,
Your most obedient Servant,
LONGFORD.

Rear-Admiral
Sir John Dalrymple Hay, Bart., M.P.,
&c., *&c.,* *&c.*

Gen. No. 5. 4577

WAR OFFICE,
6th December, 1867.

Sir,

WITH reference to the letter from this Office of yesterday's date, I am directed by Secretary Sir John Pakington to inform you that he has received a communication from the Horse Guards, notifying the concurrence of His Royal Highness the Field-Marshal Commanding-in-Chief in the appointment of the various Military Officers who had been nominated to serve upon the Special Committee on Iron Shields, of which you are the President, viz. :—

Major-General Sir W. Gordon, K.C.B., R.E.,
Colonel Adye, C.B., R.A.,
Lieutenant-Colonel E. W. Ward, R.E., and
Captain Harrison, R.A., *Secretary.*

These Officers have been warned to attend to such instructions as they may receive from you as to the time and place of meeting.

I have the honour to be,
SIR,
Your most obedient Servant,
J. ST. GEORGE, *Major-General.*

Rear-Admiral
Sir J. Dalrymple Hay, Bart., M.P.
&c., *&c.,* *&.*

Report of the Special Committee on Iron Shields.

TO THE SECRETARY OF STATE FOR WAR.

Sir,

We, the Members of the Special Committee on Iron Shields, have the honour to report to you the results of our investigation of the questions submitted to us for consideration.

1. In the letter of Instructions from the Under-Secretary of State, dated 5th December, 1867, $\frac{\text{Gen. No. 5.}}{4574}$, we were directed to inquire into the following points concerning an Iron Shield which had undergone a trial at Shoeburyness, and which we have ascertained was an accurate sample of the shields sent to Gibraltar and Malta.

1. How far the trials which have been made were unfavourable to the shield?
2. What were the causes which led to any failure in the shield?
3. What changes in the construction of such shields they (this Committee) would recommend?

2. We have carefully considered the results of the first trial (referred to in the letter), which was conducted by the Ordnance Select Committee, on the 25th October, 1867, and of the experiments which have since been made upon the Shield; we have also received much evidence upon the subject, and we think we are able to come to a decision on the first two points named. With respect to the last point, we are not yet prepared to give any definite recommendation.

3. The shield, in the first trial, was twice fired at with the 9-inch muzzle-loading rifled gun, at 70 yards distance, but with the charge reduced to 37 lbs., which, according to calculation, would cause the velocity on impact to be equal to that which the shot would have possessed if fired at 400 yards distance with the battering charge of 43 lbs. The results are given in detail in the Report of the Ordnance Select Committee, from which it appears, that in addition to the usual amount of penetration and fracture, the bolts gave way to so great an extent that the Committee considered it "unfair to the structure to proceed with the trial in the (then) condition" of the shield, and it was discontinued accordingly.

First Experiment, Appendix, p. 103.

Ordnance Select Committee Report, Appendix, p. 102.

Bolts—Causes of Failure.
Minutes of Evidence, "Quality of Iron." Q. 110, 114, 629, 657, 666, 757, 758, 759. "Improper Manufacture." Q. 24, 179, 528. "Shearing." Q. 27, 110, 193, 224, 297, 305, 360, 478, 530, 536, 540, 566, 577, 874. "Want of Elasticy." Q. 115, 195, 235, 236, 305, 477, 962, 988, 998, 1054, 1191.

4. Amongst the causes which have been suggested to explain the failure of the bolts, are, unsuitable quality of iron, improper method of manufacture, shearing from want of play in the bolt-holes, and insufficiency of elastic medium to absorb the shock.

5. After this trial, the shield underwent the following alterations, in connection with the large through-bolts:—New bolts of a somewhat different construction, and of iron of another quality were substituted; the bolt-holes of the second plate and skin were enlarged, and the space thus made vacant was filled in with wood; the inner edges of the bolt-holes of the outer plate were rounded off, and washers of "cork material" and of elm substituted for the thin indiarubber washers used in the first trial. No alteration was made in respect to the smaller bolts. On the 19th of December, the shield having been thus refitted, we proceeded to Shoeburyness to continue the experimental firing.

Second Experiment, Appendix, p. 135.

6. We first fired two shots with the velocity already adopted, in order to ascertain whether the change made in the bolts and in their application had increased the resisting power of the shield. Then, in order to put it to a more severe test, we fired at it once with the Rodman Gun, with 50 lbs. of powder, and an American cast-iron spherical shot of 451 lbs., and twice with the 9-inch muzzle-loading rifled-gun, with the battering charge and Palliser shell, both guns at 70 yards range, as we had it on high naval authority that iron-clad ships could approach sufficiently near at Malta to deliver their shot point-blank. The details of this second trial will be found in the Appendix, where it will be seen that one of the two shells completely penetrated the shield, carrying large fragments to the rear; but it struck the shield at its weakest part. The other shell, as well as the shot, all failed to penetrate completely, though they shattered and damaged the shield very seriously.

Minutes of Evidence, Q. 267.

Improvement of Bolts.

7. As regards the bolts, we found that the first of the two shots fired to compare with the first experiment, had broken only one large and one small bolt; the second, only two small bolts. It is evident, therefore, that the alterations adopted had considerably assisted the bolts in enduring this trial, and had effected a marked improvement.

Third and Fourth Experiments, Appendix, p. 140.

8. The Shield has since been fired at on two other occasions. On the 16th of January it was fired at with the 9-inch muzzle-loading rifled gun, at 70 yards range, with 37 lbs. of powder and Palliser shell, which penetrated the shield to a depth of $12\frac{1}{2}$ inches, having burst on impact. Two large bolts were broken on this occasion, from shearing, and the previous damage was considerably increased. A 9-inch Palliser-shot was also fired with the battering charge, and struck so as partly to overlap a previous shot. It broke a large piece off the front plate, penetrated to a depth of 13·8 inches, broke two more large bolts, and drove a large portion of the skin violently to the rear, adding materially to the former damage. On the 22nd of January, the shield was again fired at with the 18-ton 10-inch muzzle-loading rifled gun, with a Palliser shell weighing 396 lbs., containing a bursting charge of 10 lbs., at 70 yards. The charge used was 54 lbs., to give a velocity equal to what would be due to the battering charge of 60 lbs., at 400 yards range. The shell struck below the port-hole, penetrated both plates, but not the skin, broke two large pieces off the lower girder, and one large and one small bolt. The shield was a good deal shaken by the explosion of the shell.

Opinion of Committee.

9. A careful consideration of the general results of these trials has led us to the conclusion that they were unfavourable to the shield, and that it is not strong enough to resist the direct attack of powerful ordnance at a dis-

tance of 400 yards. The shield is not sufficiently massive, nor does it appear to us to be of the most favourable construction.

Various witnesses have testified to the weakness of the girders—to the insufficient thickness of the front plate—to the danger to the gun detachment from the multiplicity of bolts, nuts, and rivets in a structure wholly of iron*—to the weakness on each side of the embrasure—to the insufficiency of the skin as a support, and to other defects. On the other hand, it has been stated that the construction adopted in these shields has the advantage of being easily strengthened to any required degree by superimposing additional armour-plates, or by substituting thicker ones.

Defects in Shield.
Minutes of Evidence.
"Girders."
Q. 110, 140, 167, 311, 676. 677, 1361.
"Thinness of Front Plates."
Q. 103, 180, 184, 241, 255, 259, 268, 298, 314, 331, 448, 476, 607, 678, 683, 733, 835, 983, 1056, 1327.
"Multiplicity of Bolts."
Q. 239, 241, 563, 694, 1191.
"Weakness of Embrasure."
Q. 96, 193, 311, 427, 497, 675, 830.
"Insufficiency of Skin."
Q. 167, 180, 428, 598, 750, 751, 752.
"Easily strengthened."
Q. 2, 24, 28, 30, 40, 80, 550.

10. Many different methods of strengthening these shields have been suggested to us, but we do not consider that the question of their improvement can be satisfactorily dealt with until after further experiment. Hence we recommend that two of the shields be returned to this country and experimented on, with a view to ascertain how far the remainder are capable of improvement at a reasonable cost, and to gain experience for the future.

Methods of Strengthening.
Minutes of Evidence, pp. 9, 86, 91.
Appendix, pp. 96, 98, 100.

Recommendation of Committee.

11. Neither are we prepared, without experiment, to state what changes we would recommend in the construction of future shields, or the principles that should guide their designs. The principles on which Floating Defences are now constructed were arrived at after careful experimental investigation, and we recommend that a similar course be pursued as regards shields for Land Defences, the conditions of which are very different.

Future Shields.
Minutes of Evidence, Q. 116, 144, 270, 517, 523, 562, 740, 840, 1321, 1322.

Reasons have been urged in favour of substituting a backing of iron for that of wood adopted in the navy. It seems most desirable that this, as well as other principles of construction, should be submitted to the test of experiment.

12. Finally, we are of opinion that shields for important positions on Land Defences should afford greater protection than the one now reported on. The cost to this country of stronger shields would be small in comparison to the outlay necessary for their destruction.

(L.S.) J. C. D. HAY.
J. W. GORDON, *Major-General.*
JOHN ADYE, *Colonel R.A.*
E. W. WARD, *Lieutenant-Colonel R.E.*
WM. FAIRBAIRN.
WILLIAM POLE.
JOHN PERCY.

A. HARRISON, *Capt. R.A., Secretary.*
11*th February*, 1868.

* Experiments made by the Special Committee on Iron showed that the concussion of projectiles is very injurious to the fastenings of a rigid structure such as a target wholly of iron.—Report 1861-2; Pars. 33-53.

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MINUTES OF EVIDENCE

TAKEN BEFORE THE

COMMITTEE APPOINTED TO ENQUIRE INTO IRON SHIELDS, AT THE WAR OFFICE.

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esday, 10th December, 1867.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Ch*
Major-General Sir WILLIAM GORDON, K.C.B., R.E.
Colonel ADYE, C.B., R.A.
Lieutenant-Colonel WARD, R.E.
Dr. PERCY, F.R.S.
Dr. POLE, F.R.S.

Captain HARRISON, R.A., *Secretary.*

General Sir JOHN BURGOYNE, Bart., G.C.B., examined.

General Sir J. Burgoyne, Bart., G.C.B.

10 Dec. 1867.

1. (*Chairman.*) The Committee are very anxious to receive from you any information to guide them in the course of the investigation they are about to make, or which will throw any light upon the question submitted to them. Will you, therefore, be kind enough to state whether the trials which have been made upon the shield which is supposed to be a sample of the shields which have been sent to Gibraltar and Malta, have been unfavourable or otherwise?—In the consideration of the question of covering guns with armour-plates, I do not think that sufficient distinction has been much drawn, as yet, with regard to the difference in the requisites for what is intended for armour-plated ships, and for batteries on shore. They have generally been put together, and the whole matter has been considered as one question, whereas they are very different. In the first place, armour-plating for ships requires a great deal of refinement, both in manufacture and in material, to gain points which are absolutely necessary for that service. First of all, to obtain the greatest degree of lightness possible, which is essential in armour-plated ships, of course requires fine metal and fine manufacture; but that is of no consequence on shore. Then, I presume, the not occupying much space is of consequence on board ship, but that again is not so on shore. Again, the armour-plating for ships forms part of the structure of the ship itself, and tends to bind it, so to speak, and to keep it together. It must be so contrived as not to admit of any openings of the smallest kind, or cracks which would be acted upon either by the motion of the ship, or by shot or shell, because they might let in the water. All that again is not necessary on shore, and, therefore, it is evident, I think, that a much less expensive structure would be available on shore, as compared with what is required on board ship. I believe that the armour-plating of ships costs upon an average from 30*l.* to 40*l.* per ton, and you can get rolled iron in masses that would be very serviceable, and perfectly equal, by a small addition in quantity, to resist any shot, at half the price. That, of course, would make a very enormous difference. Then, I think, that it would be a very great advantage, referring now to the armour for shore batteries, if it could be of a composite construction, and made in distinct and separate masses, which is not available for ships; a great advantage in this would be for transport, and facilitating constructions and repairs. Then, again, as to the effect of fire upon them, the

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10 Dec. 1867.

armour-plating for ships must be prepared to resist the heaviest shot fired at very close quarters; but that is not the case on shore. I am alluding now to batteries employed against shipping entirely, and nothing else. There is no shore battery which a vessel can approach within 200 or 300 yards, or very seldom; and, even if it be possible, it is a sort of thing that ships would be very cautious of doing in the smoke and all the turmoil and excitement of action, for fear of getting ashore. In many cases the distance is considerably more, so that ships cannot get within 400, 500, or 600 yards; and it makes also a very great difference in the power to resist the effect of shot, that the shot from the shipping must come in a very scattered way; it would only be a shot here and there that would do any mischief, because it is impossible that they can concentrate their fire on any special object, on account of the motion of the ship and the smoke; and that is another reason why the armour for a battery would not require to be of the same strength. Then it would require a great deal of firing to put three or four shot into the space occupied by one embrasure, because the fire from a ship directed against a shore battery must be precarious, at all events there would be very few shot that would hit in comparison with the number that would miss, and more particularly if the guns on the shore were upon any elevation, because there the elevation of the guns in the ship, which must be all done by calculation or by the eye, must be very uncertain, and liable to error. Again, if one or two embrasures were destroyed, the effect of that would be, that there would be less damage done to the others, and thus you might abandon such embrasures, and go to other guns. All these considerations should lead to the seeking for a kind of structure which would do for the shore, quite different from the other; but I do not think that that matter has yet been thoroughly ventilated.

2. I may remind you that it is with regard specially to the Gibraltar and Malta shields that this Committee are appointed to make their inquiry?—Yes; and I think that what I have mentioned bears upon that question, that is, that the best mode of construction for batteries has, I think, been not yet much considered. In the meantime, the Government could not stand still; and a certain number of these shields were provided for in the estimates as the commencement of the armament for Malta and Gibraltar. It was thought right to send them out, and Colonel Inglis was employed, as an officer who had been engaged at Shoeburyness in preparing iron constructions for batteries to provide for an emergency, to make plans for these shields. He prepared them, the shields were ordered, and they were sent out. Since that time a sample of them has been tried, and it is considered to be inefficient. But I cannot think that it is so to the extent which has been stated. The bolts have given way, and they evidently require some other form of construction. I believe that that has arisen very much from the new guns and the pointed shot which have been directed upon them, and which have more effect upon that form of construction. The two shots which hit the target made a great impression upon it, but the principle upon which the target is constructed appears to me to be a good one. But it would seem to require for very exposed situations (for the fire was directed, I imagine, in a very powerful manner against it) some additional material to strengthen it—that is to say, to add to the mass of the iron, which can be very readily done, and the bolts can be altered, so that altogether I do not believe that so much mischief has been done by sending out these shields as has been attributed to them. Upon the whole, the result of my argument would be this, that we do not require to make for the shore our shields so perfect as they are required to be on board ship. If they will stand a scattered fire, and each shield will stand, say four or five shot, I think it is as much as you ought to attempt, on account of the enormous expense that you must incur to get a greater degree of security, and which it would not be worth while to incur, considering the great number of shields that we shall have to provide. I, therefore, do not think that you ought to aim at such perfection, when it is attended with such great expense, for shore batteries as you must on board ship. There are certain cases of batteries on shore, however, where the exposure is greater than on others, and I think it would not be unadvisable, for that reason, to have two classes of shields, one for situations that were very much exposed: for example, I am told that the Russians have now ordered some shields that will be upwards of 2 feet thick in iron; but the reason why they have done so is to provide for important sites where a small number of guns collected together in one spot would be very much exposed to fire. They, therefore, go to any expense for that purpose. That, however, would not be necessary where you had sites less exposed. In some places which were, perhaps, very much exposed I would put first-class shields, and in others, which were less exposed, rather inferior ones.

3. I think it would be right, as the old Iron Plate Committee, of which some of us present were members, made a special Report, that you should hear read what we did say upon the subject, in consequence of something which has been said to the effect that it was by the suggestion of the old Iron Plate Committee that the protection or cover to the shields was not made thicker. Although that was stated, I think you will find that it was not so, and I am therefore rather anxious that it should be read?—I have not assumed that that was the case.

4. No; but as I should like to put a question to you, viz., whether the construction of the shield was at all based upon that Report, the Secretary will now read the passage. The following extract from the Report, dated 18th July, 1862, was read:—

"It appears then that even a 15-inch shield, if constructed in three layers 5 inches thick, could not long resist such a gun as the 300-pounder, with large charges of powder, the initial velocity of the gun and the work done being so great that nothing less than 7¼-inch iron will resist it; probably, therefore, plates or planks 8 inches thick are the least that should be used in a coast battery. Planks of that thickness, backed with cast-iron, or by a second 8-inch plank, would, it is conceived, offer sufficient resistance, even to 50 lb. charges, at short ranges."

A. I think it is very desirable to seek for the least expensive shield that will cover guns on shore.

5. On extended fronts, you do not look for perfect immunity?—That is of less consequence on shore, as you may have 40 or 50 guns in battery, and when you have two or three of them disabled, you have recourse to the others. I have always been an advocate for having an excess of

guns, even where you have a fixed quantity of ammunition and number of men, because you can go from one gun to the other. Being previously loaded, you have a first round ready from all.

6. (*Colonel Adye.*) Looking at the section on the table, and supposing a battery to be in a most exposed situation, should you consider that that would be a sufficient shield for it, if the shot had the effect shown upon that section, which is a section of the Gibraltar shield after the shot had struck it [pointing to the same]?—After the shot had hit it in that sort of way, the gun would still be serviceable. It would be quite available for service after the shot had gone in. This shot [pointing to the section] would not have injured either man or gun.

7. (*Chairman.*) Except by reason of the bolt-heads flying?—No doubt they must improve their bolts. I say that if the impression made was only this [pointing to the section], I think it would be sufficient: that is to say, it is not perhaps what one would like to have, but taking all things into consideration, if an improved target of greater strength is to cost much more money, I think I would rather have this one. I hold that unless it were hit by several different shots (and I admit that another shot coming near to this [pointing to the section] would certainly do great mischief and make perhaps an opening), even three or four shots striking the target there [pointing to the section], somewhat scattered and not very close, would not render that gun unserviceable. Certainly it is not perfect protection by any means; but you have this resource, that if you are driven from one gun, you can go to others.

8. (*Mr. Pole.*) This [pointing to the section] having been damaged by one shot, is not its efficiency as a shield destroyed, so that if another shot struck it, it would afford no protection, but do much mischief? Is not the shield, therefore, after it has been once struck in this way, in point of fact destroyed?—Another shot striking here [pointing to the section] would do a great deal of mischief. It would perhaps kill and wound several men; but it is a very great chance whether a second shot would hit near the other. I do not call this a perfect target by any means. I only say that it is a great question of expense; and where you have hundreds and thousands to deal with, I think you ought not to go to great refinement, because it costs so much money.

9. (*Dr. Percy.*) I think you stated that great masses of an inferior quality of iron might be obtained at about half the price of similar masses of a superior quality?—Yes.

10. Will you be good enough to state whether the War Office are in possession of any facts bearing upon that subject, and whether they have ascertained the difference in cost per ton between plates of the same thickness, say 6 inches, made respectively of a superior quality of iron and of an inferior quality?—Armour plating for ships, I am told, costs between 30*l.* and 40*l.* a ton. As to inferiority, I do not like the term, merely because it does not possess the peculiar qualities required for the other; but if iron plates rolled, of 5 or 6 inches in thickness, as they were first rolled by Thornecroft, cost 16*l.* a ton, that is, about half the cost of the other, that is the kind which I think might be applied for shore batteries.

11. Does not the great expense of thick plates chiefly depend upon the cost of manufacture, and not upon the quality of the iron?—That I do not know.

12. Have any experiments been recently made upon thick armour-plates for coast batteries, say 6 inches thick, and made of inferior iron?—I do not know perfectly what the experiments are which have been made, but my impression is that it has not been studied sufficiently.

General Sir J. Burgoyne, Bart., G.C.B.

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13. Can you state whether, with the view of reducing the cost, any direction was given to have the Gibraltar and Malta shields made of inferior iron?—I do not imagine that there was any direction of the kind given.

14. The first question is that which relates to the quality of the iron, and the second the quality of the plate when manufactured; and I understood you to state that great masses of an inferior quality of iron might be obtained at about half the price of similar masses of a superior quality?—I should imagine that any iron which is rolled 5 or 6 inches thick cannot be called inferior iron.

15. (*Chairman.*) I think you mean iron that you can obtain cheaper from the manufacturer?—Yes.

16. (*Dr. Percy.*) I think you stated, in the case of coast batteries, that if they resisted four or five shots, that would be as much as they ought to be expected to resist, and that great expense should not be incurred in the construction of such batteries. Can you give the Committee any reason for that opinion?—I think that in very exposed situations, where the guns are concentrated very much, and are liable to be heavily battered, I certainly would give increased power of resistance. I would take it as a general question of relative expense and requirements altogether.

17. Have you any particular reason for supposing that it is not probable that there may be new methods of construction discovered, whereby a great mass of iron might be used, and yet at a much smaller cost than under the present system?—That is exactly the object that I think has to be sought for.

18. (*Chairman.*) Have you any question of that kind under consideration now?—No.

19. (*Colonel Ward.*) Will you be good enough to state whether, in the construction of this shield, you consider it was made of sufficient thickness, or whether, if it would stand four or five shot, it would be strong enough?—No question of that kind arose in the construction of the shield at all. I do not think it has ever been mooted before, and very likely other people would not have the same feeling that I have upon it.

20. Do you consider that a shield of this kind is sufficient to stand four or five shot?—If scattered shot, which is what they are exposed to, I think it would; but considering the number of guns that we have mounted on shore batteries, as opposed to shipping, even if two or three of the embrasures were destroyed, it would be of no very great importance.

21. Is it your opinion that this particular shield would stand the three or four shots that you think would be sufficient for any battery to receive?—With regard to Gibraltar and Malta, I may say that they are most favourable places for shields of less power than might be thought generally advisable, because of the situation of the works and the variety of positions in which they would be placed.

22. Are you of opinion that this shield is strong enough for those places, after seeing the report of the trial to which it has been subjected?—I think it is quite strong enough for some of the inferior positions, but I would put in additional strength

for batteries that were the most exposed, and additional strength could be easily applied to them.

23. (*Chairman.*) Is there anything else that you would like to state to the Committee?—No.

(The witness withdrew.)

Colonel W. F. D. JERVOIS, C.B., R.E., examined.

Col. W. F. D. Jervois, C.B., R.E.

10 Dec, 1867.

24. (*Chairman.*) Will you be kind enough to state how far you think the trial which has been made of a sample of the shields sent to Gibraltar and Malta was unfavourable or otherwise?—I think the trial was unfavourable to the bolts with which the shield was fastened together (these were specified to be made on Palliser's principle; Major Palliser, however, considers they were not so made), but that, on the whole, it showed that the shields referred to are capable of affording sufficient protection against the power and amount of artillery fire which would be likely to take effect upon them in the event of attack by ships of foreign Powers in the present day. By using more iron and incurring greater expense, of course stronger shields can be made; the shields under discussion were so constructed that their strength might easily be increased at any time, if thought desirable.

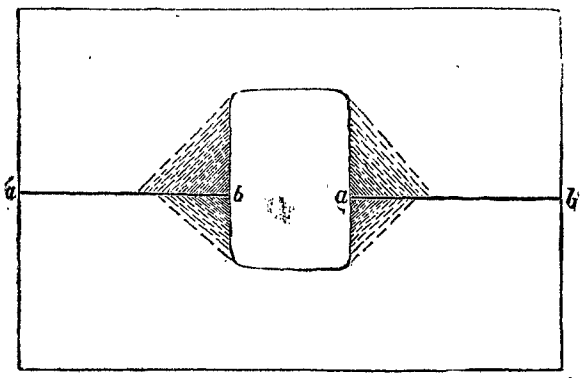
25. Will you be good enough to state to the Committee what were the causes which led the War Office to adopt 5½-inch plates, backed by 5-inch plates, for the shield, and what were the causes which led the War Office to adopt the method of fastening by the bolts, and the general mode of construction. I call your attention to the fact that the Committee, of which we were both members, recommended that iron of not less than 7¼ inches should be used for the front of the Inglis shield, and I think it desirable that you should state to the Committee why iron of the thickness used was adopted, whether for economical or other reasons, and generally why you adopted the form of structure now called the Gibraltar shield?—The first shield proposed by Lieut.-Colonel (then Captain) Inglis, was composed of "planks" 5 inches thick, but only 14 inches wide; it was fastened together with 2½-inch bolts, each having a washer of lead under another of iron beneath the nut. The shield consisted, one-half of two layers, the other of three layers of "planks." The practice against this shield showed that it could not resist the 300-pounder 12-ton gun of that day, fired with hemispherical-headed shot. In the Report of the Iron Plate Committee (page 117 of the Report of 1862), while favouring the construction of this shield, they suggested that improvements should be made by using stronger nuts and elastic washers, to meet the impact of such guns as 300-pounders, and that a thickness of at least 7¼ inches would be necessary for the outer plates or planks. I may here observe that a wrong expression has crept into the observation of the Iron Plate Committee, and that the words "plates" and "planks" are used as if they were interchangeable words, which, of course, they are not. In considering the resistance of iron "plates" or "planks," the sectional area as well as the thickness must be taken into account. The armour-plates now under consideration are 5½ inches thick and 4 feet wide, while the planks which were under the consideration of the Iron Plate Committee were very much narrower—indeed, not [illegible] as wide. When you have armour in *plates*, you may use a less thickness than would be necessary in *planks*, to give the same resistance. In Inglis's second shield, only two thicknesses of iron planks were used, the outer layer being composed of planks, respectively 6, 7, and 8-inches thick, and the inner layer of planks 5 inches thick. In this case, 3-inch bolts were used, with elastic washers and strong nuts. The practice against the shield was carried on on the 29th of September, 1862, with a 68-pounder, 110, and 120-pounder, and very little effect was produced. On the 3rd of March, 1863, a battery of the heaviest guns was used; the guns were, a 300-pounder muzzle-loading shunt gun of 12 tons, calibre 9·2-inches, a 100-pounder smooth-bore, a 130-pounder Whitworth rifled gun, and a 7-inch rifled gun of 7½ tons, the range being 200 yards. The Report of the Iron Plate Committee, in 1863, pages from 203 to 206, was very much in favour of the shield. I wish particularly to draw attention to the remark in the report with reference to the 300-pounder muzzle-loading shunt gun. "The shot, which was of cast-iron, was hollow-headed, and weighed 230 lbs., charge 45 lbs.; it struck 1′ 9″ from the bottom, made only a small indent, but cracked the plank struck across in two places, broke one bolt with lead washers at the screw, made a considerable bulge on the back of the shield, started two bolts slightly, and had considerable effect on the shield. The velocity was 1,400 feet." The striking energy of this shot was upwards of 109 foot tons per inch of the circumference of the shot. This is, as nearly as possible, the same force as is exerted by a 12-ton 9-inch gun, with a charge of 43 lbs., and a 250 lb. shot, and which force from that gun, when fired with chilled shot, with a pointed head, is sufficient completely to penetrate the whole target of 8-inch solid plates on a "Warrior" backing (*vide* Report of Captain Noble, pages 52 and 53). That backing, I think, represents something like 4½ inches of iron, or nearly 5 inches, so that I think it may be assumed, from this and other considerations, to which I will presently refer, that the system of 8-inch planks upon 5-inch planks, as used in Captain Inglis's second shield, which was reported upon by the Iron Plate Committee in 1863, was probably, not the best arrangement of iron for a shield of about that total thickness. Then we had two shields tried in connection with the experimental casemates at Shoeburyness, one called Chalmers', and the other a solid plate of 13½ inches.* Chalmers' shield was about 12 feet by 8, superficies, and the other was, I think, 6 feet square. Chalmers' consisted of a 4-inch plate, upon 8 inches in depth of horizontal, laminated iron, upon a 2-inch plate, next it had 6 inches of teak, and 1 inch of iron, or altogether 15 inches of iron and 6 inches of teak. The reasons which appeared to weigh against adopting it were the probable effect of pointed shot against the laminated horizontal plates behind a 4-inch plate, and there would be a difficulty, without incurring extra expense, in constructing the embrasure so as to give sufficient lateral range. In this target there was very little lateral range. Then there was another shield, the principle of which I had personally thought well of, and upon which the Millwall hollow stringers were used, but we had not had at the time any experience of it, and we abandoned the idea of using it. Experiments are about to be carried on at Shoebury, in which these hollow stringers will be tested, and it will

* See Appendix, xvi., p. 130.

then be known whether it will be advisable to adopt them in future constructions. Another species of structure was recommended by many, viz., a solid plate target of one thickness, but in the first place there would have been great delay (which it was desirable not to incur at the time), in making a shield of solid construction, and in the next place it was in itself not a good construction. There was another construction which had been adopted by the Russians as a protection for a few guns, viz., bars of iron placed one over the other, the bars about 12 inches square, and rolled with tongues and grooves. Independently of this shield costing about 2,200*l.* per gun, its principle is not calculated to resist the fire of pointed shot.

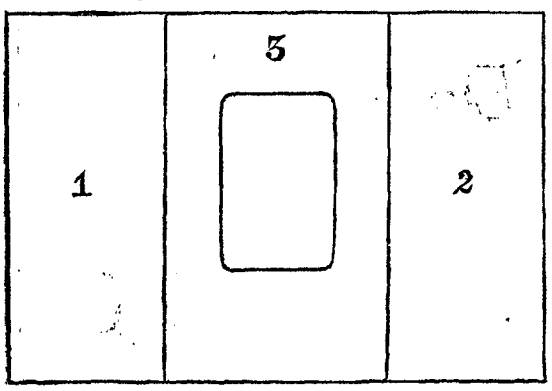
26. The causes were, I presume, political?—The causes were to some extent political, and to some extent financial, for we only had a certain sum of money available. One reason against using the solid shield is that you cannot have a rolled plate 8 feet broad, so that you are obliged to have it in two pieces at least (see fig. 5); then you have to rivet

Fig. 5.—Shield of two solid thick plates, having weak surfaces through *a b*, the shaded portions are also weak.



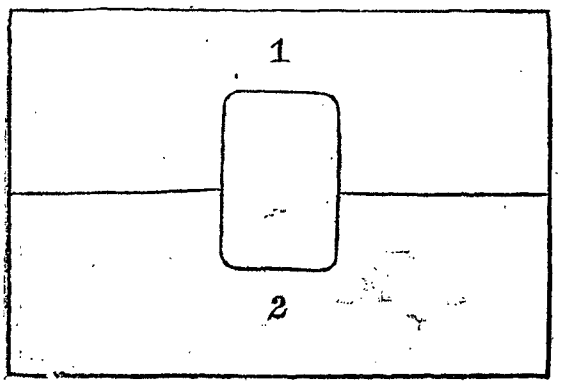
the two plates to the struts, and you have a horizontal fracture already made in it, which is a source of very great weakness. Then the question would be whether you would construct it in two thicknesses and cross them? That, again, gives you a structure, taking the best arrangement of the plates that you can have—1 (see fig. 3), 2, 3, with

Fig. 3.—Elevation of 5-inch Plates.



the *port in it behind*, and 1, 2, in front (see fig. 4).

Fig. 4.—Elevation of 5½-inch Armour Plates.



Scale $\frac{1}{20}$.

That gives you two horizontal lines of fracture, ready made, through the thickness of the shield. Then you come to three thicknesses, so as to avoid any such line of fracture, and the plan adopted is this: there is a backing like that [describing] (see fig. 1), on which is the 1½ plate

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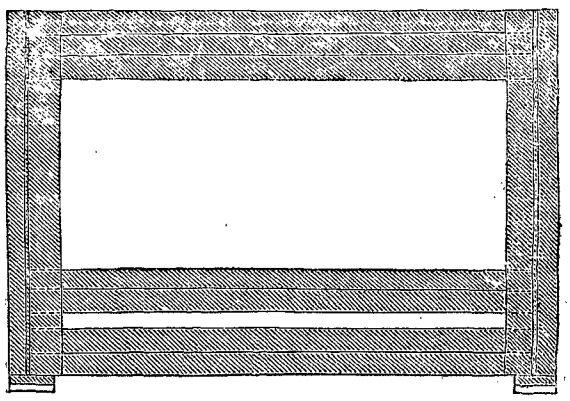
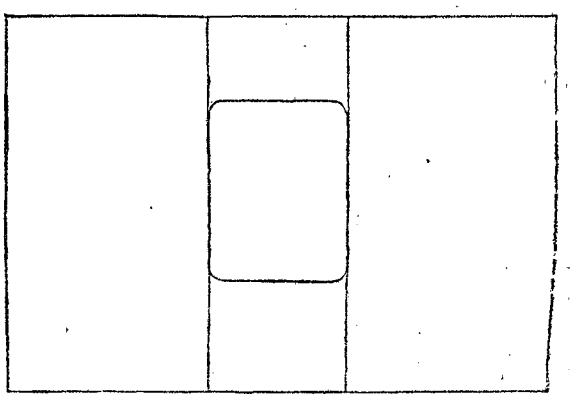
GIBRALTAR SHIELD.

Fig. 1.—Elevation of Struts and Girders.



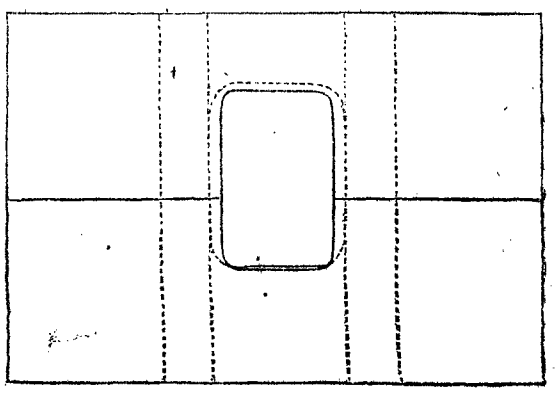
(see fig. 2); then there are the 5 inches and the

Fig. 2.—Elevation of 1½-inch Plates.



5½ inches. There you have no point through which the horizontal line of fracture runs (see fig. 7).

Fig. 7.—Exterior elevation of shield in three layers of plates. Dotted lines show the joints.



Another consideration which occurs to my mind is this, that it is doubtful whether the so-called law of resistance: that is to say, the resistance of the plates being as the square of their thickness, holds good beyond 5½ inches, and whether uniformity of resistance can be depended upon when that thickness was exceeded. From the Report of Captain Noble, at page 28, you would infer that the law did hold good up to a thickness of 8 inches (it is the last paragraph but two from the bottom of page 28), and yet the experiments since made show this law to be unreliable beyond a thickness of 5½ inches. The experiment to which I refer took place after

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this shield was made, and without any reference to it; but it quite confirms that hypothesis. The Ordnance Select Committee Minute, 22,205, 4th June, 1867, volume 5, page 125, reports thereon. It was an experiment upon plates 7 inches thick, and this observation is made at the end of the record:—"The plates were penetrated with greater ease than was expected; this may be due either to the shot being of a better brand than those fired previously at unbacked plates, and reported on Minute 21,886, or *to the resistance of iron plates to perforation by pointed chilled shot not varying as the square of the thickness beyond 5·5 inches.** Of the combined plates, No. 3, steel-faced, showed the greatest resistance." These and other considerations to my mind justified the adoption of the dimensions used for the plates in the shield now in question, and by using the plates in layers of 5½ inches, 5 inches, and 1½ inches, to make up a thickness of 12 inches (money being limited), the following points were gained: The best method of breaking the joint was secured, and the defect of having numerous joints was guarded against, whilst the thickest plates, whose resistance could be relied upon as to uniformity, were used for the exterior armour. Beyond 5½ inches the resistance in proportion to the thickness probably decreases, whilst though the cost per ton, up to a moderate additional thickness, may remain the same, yet beyond that additional thickness, it is proportionably augmented: that is to say, while beyond a thickness of 5½ inches the resistance may decrease proportionably, the expense proportionably increases.

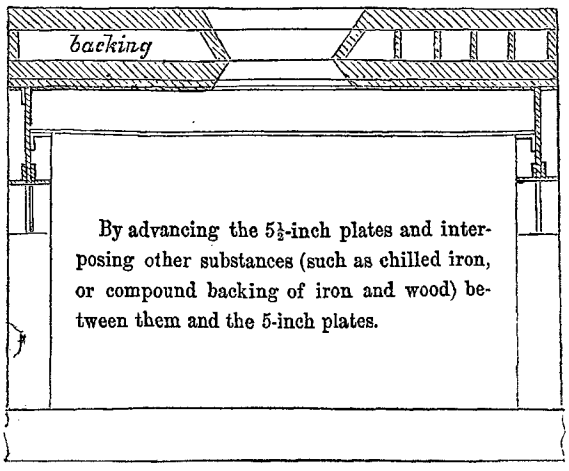
27. Do you consider that you get the most for your money in that way, upon the whole?—Yes; as I shall show by and bye. It was with reference to the possibility of events occurring abroad which might involve this country in difficulties with any European Power or Powers, that we had to consider what we were able to provide, and what power of gun we had to provide against. I have a list here of the guns that are used in European navies at the present time, and it will be found that not one of them exceeds, if it is equal in power to, our 12½ ton 9-inch gun, so that if the shield was capable of resisting that gun, it would be capable of doing the work it was required to perform. Again, if we compare the 9-inch 12-ton gun and the 15-inch smooth-bore Rodman gun, we find the more powerful is the rifled gun, whose striking energy at 200 yards is from 108 to 109 tons per inch of circumference of shot; and the American gun has only 104 tons per inch at 200 yards. As the range increases, the superior force and greater accuracy in practice of the rifled gun, make it quite distance the smooth-bore. Considering the improbability of any vessels carrying such guns being able to range themselves nearer than at a distance of 400 yards from the batteries for which the shields were intended, it was thought that the 12 inches of iron in the shield in question would be sufficient to prevent penetration, and this appears to be confirmed by recent experiments. As to the question, whether it is 400 yards or 200 yards, even if there be no great difference in the power of the shot at 200 yards and at 400 yards with the rifled gun, I do not think that any ship would be able to get within 400 yards. I am quite sure that we should be able to keep her at a very much greater distance by means of torpedoes, which we should sow in the water and keep there as so many batteries under water and under cover of the fire of our guns—in fact, one great function now of the fire of batteries is to protect the gun under water (which the torpedo may be considered to be), and prevent it being taken away and tampered with. Then one comes to the bolt question; it is said that the system of bolting has not been successful in this shield, and that has been attributed by some to the nature of the iron which was used. It is attributed by others to the shearing effect of the two plates, which has assumed a different aspect under the effect of Palliser's chilled pointed shot. If you will consider the action of the two as shown in this diagram, I think it becomes apparent that the round-headed shot has less tendency to push aside the material while perforating the plate than the pointed one has, for the latter pushes the material sideways. That was a thing that we had had no experience of before, for when the Iron Plate Committee fired at Captain Inglis' shield, there was no such effect produced, and there has been no such effects shown on bolts before. It is something new that we find we have to deal with, and this is one cause of the bolts yielding. It is a new element which from this time forth we shall have to deal with, but which we did not know of before. The bolts mostly broke off at about this distance [pointing to the diagram].

28. Has it not also been attributed to the bolts being screwed up too tight?—Yes; Colonel Inglis attributed it to that, and I may mention that another cause has been suggested, which is what they call the heads being "upset" instead of being made in the way that Major Palliser thinks that they should be made. Supposing you had a piece of a bolt, if you knocked it on the head and made it into that shape [describing], the fibre would get like that [describing], and there is an inclination to break. Major Palliser recommends that the bolts should be made in such a way as to be longitudinally drawn out; but it is a question whether the additional strength of Palliser bolts is not obtained by their being hammered in a particular way. I have already said that the sharper the point, and the harder the shot, the greater will be the force exerted in a direction parallel to the plate, and consequently at right angles to the bolt, tending to shear the latter; or, to explain it roughly, a flat or round-headed shot will push the plate in front of it, while a pointed shot will thrust it aside laterally. With regard to the financial considerations connected with the supply of these shields, I have before stated that we wanted to get some of them out as early as we could; and in the next place the money which was available for this purpose was only 30,000*l.*, which had to be taken, with the sanction of Treasury, from another vote—namely, the defences of Quebec, and so we had to consider what it was best to do with that 30,000*l.* In Gibraltar or Malta, where there are, in the one case, between 900 and 1,000 guns, and in the other between 600 and 700, it seemed quite a small number to provide at each place 15 powerful guns; and therefore it was thought advisable, and I believe it was advisable, to construct them at a cost of about 1,000*l.* apiece, which was about the sum paid for them. In short, it was considered better to cover the greatest number of guns that could be covered with minimum protection, rather than to shelter a smaller number more amply. The system adopted was believed to have fulfilled this requirement, while it allowed additional plates to be used to strengthen the shield at any future time. It will be seen, if you look at the drawing of the shield, that you may take the outer plate off, and you may put in a plate of wrought-iron or cast-iron, or horizontal Chalmers'

* Italics not in original.

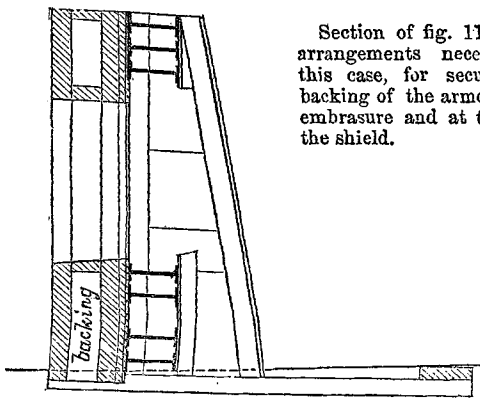
bars (see figs. 10, 11), with material between them ;

Fig. 10.



By advancing the 5½-inch plates and interposing other substances (such as chilled iron, or compound backing of iron and wood) between them and the 5-inch plates.

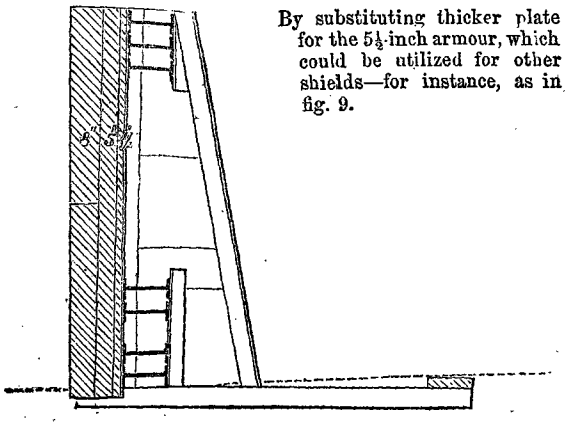
Fig. 11.



Section of fig. 11 showing arrangements necessary, in this case, for securing the backing of the armour at the embrasure and at the top of the shield.

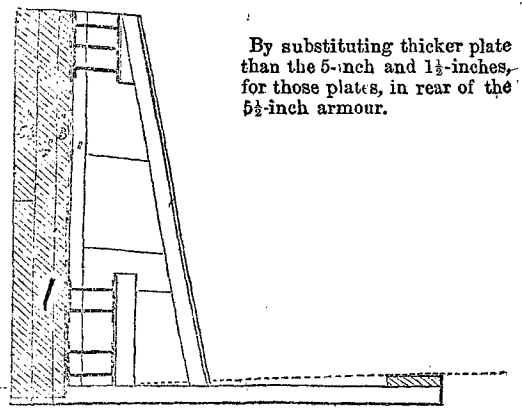
and it will be a question which system it may be desirable to adopt, if you want greater thickness, and supposing the navies of Europe to have more powerful guns on board their ships. In short, the 5 inches, plus 1½ inches, formed, as it were, a backing upon which you might put hereafter any necessary strength of shield. If you went beyond a certain extent, you would have to get a few new bolts besides; or supposing hereafter it was considered advisable, instead of a 5½-inch plate outside, to have thicker plates instead of the composite constructions I have referred to, you might take that 5½-inch plate as it is, and incorporate with it a skin either 1½ or 2 inches thick, and put it into parts in other shields used at the same places for that backing. You might take the plate out and put another in, so that the shield would become then as seen in fig. 8. Figs. 9 and 12 also show methods for strengthening the shield.

Fig. 8.



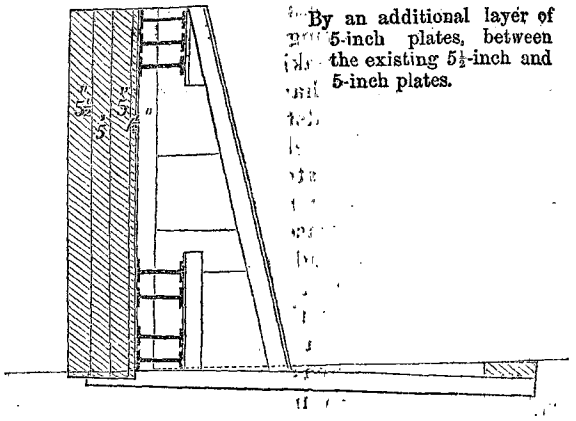
By substituting thicker plate for the 5½-inch armour, which could be utilized for other shields—for instance, as in fig. 9.

Fig. 9.



By substituting thicker plate than the 5-inch and 1½-inches, for those plates, in rear of the 5½-inch armour.

Fig. 12.



By an additional layer of 5-inch plates, between the existing 5½-inch and 5-inch plates.

29. The parts would be so far interchangeable that the whole of those parts would be available, and the shield could be added to without any considerable expense, other than that of the additional plates?—Yes; and that expense would have been incurred if the thing had been made thicker at first starting.

30. (*Dr. Pole.*) In short, according to your evidence, the shield is capable of being added to?—Yes; it is capable of being made of any strength that you like, and at a small expense.

31. (*Chairman.*) Have you any plans at the present moment under consideration for strengthening these particular shields in the fortifications for which they are intended?—Yes; I have two or three plans.

32. Has any plan yet been adopted?—No.

33. There has been no proposition for the purpose of giving additional strength?—Yes; we have had propositions; there have been several of them, but the War Office has not decided on adopting any of them.

34. Is there any plan which has not yet been adopted for the purpose of giving additional strength, should the War Office decide so to do?—No; that is a question which remains for consideration.

35. My question naturally tends to this; whether any estimate has been made of the additional expense to be incurred by strengthening these shields up to any point upon which the War Office may decide?—I should think, speaking roughly, that 250*l.* would cover anything that you wanted to do with it: that is to say, 250*l.* per shield. There is one thing which I should like to advert to, which, in my opinion, is a material one. It is very common, in speaking of the trials to which these shields and forts will be subjected in actual warfare, to talk about a great number of shot hitting

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nearly the same point in the shield. I have gone into the question, with the view of ascertaining, as well as I could from actual instances which had occurred, what number of shot had in action hit a given area of a fort. The case that I will refer to is that of Fort Sumter, for precise information has been obtained with reference to it. I will quote from a paper which I wrote on the subject some little time ago:—"In the official report of the action by the Engineers of the Confederate Army at Charleston there is a detailed record of the effect of the firing upon the fort. I have a copy of this report, an abstract of which is given in the accompanying memorandum A.

A.

AN ANALYSIS of the Statements contained in a Confidential Report by Major D. B. HARRIS, C.S.A., with reference to the bombardment of Fort Sumter, Charleston Harbour, by the Monitors and "Ironsides," under the command of Admiral Dupont, on the 7th of April, 1863.

Fort Sumter was a brick casemated work, designed to mount two tiers of guns in embrasures, and one tier "en barbette;" in all, 135 guns. The upper tier of embrasures was not finished by the Federal Engineers, and was never completed by the Confederates. The spaces left for them were walled up with brickwork. At the date of the bombardment the exposed faces (viz., the eastern and the north-eastern) mounted 33 guns.

The fort was bombarded from distances varying from 900 to 1,500 yards, with the following results, viz.:—

DETAILED TABLE.		REMARKS.
	Feet.	
15-inch Shells—		
8 Shells struck fairly; average penetration ..	2·40	Two of these shells "destroyed" two embrasures, two others dislocated the masonry of two piers, and knocked out the arches of the embrasures. One shell broke, and stuck in the sole of an embrasure.
1 Entered W. Quarters, exploded, damaging walls.		
3 Scaled, ricochetted and spent.		
12 Total.		
11-inch Shot—		
4 Shots struck fairly; average penetration ..	2·25	One shot destroyed an embrasure; the damage caused by the remainder was inconsiderable.
1 Entered W. Quarters.		
2 Scaled, ricochetted and spent.		
7 Total.		
Fragments of Shells remaining—		
1 Struck obliquely; no damage	..	No damage.
9 Scaled, ricochetted and spent.		
10		
Various Missiles: nature indistinguishable—		
20 Struck fairly; average penetration	1·65	These missiles fractured and shook the masonry to some extent, but the general effect was not very considerable.
1 Knocked away, and broke in three pieces, a 6-inch iron slab, weight 6 cwt.		
1 Demolished a 10-inch Columbiad carriage.		
1 Struck end stone of masonry berm.		
6 Ricochetted, or struck obliquely.		
29		
Total number of projectiles fired at the fort ..	80	
Total number of projectiles striking the fort ..	58	
Proportion of the same striking effectively	$\frac{4}{10}$	
Proportion of ricochets and spent balls	$\frac{1}{4}$	
Proportion of cases in which two shots struck the the same point	$\frac{1}{80}$	Extent of crater 12 feet sup. Masonry cracked, exterior key-stone and interior arch of embrasure knocked out.
Proportion of cases in which three shots struck the same point.*	$\frac{1}{80}$	Extent of crater 80 feet sup. Parapet wall cracked 25 feet long; serious damage.
Proportion of embrasures destroyed to those exposed	$\frac{1}{7}$	

* The embrasures were of brickwork 5 feet thick.

The attacking force consisted of eight turreted ships (Monitors), one with two, the rest with one turret, and the "Ironsides," an iron-plated ship of 16 guns. The guns in the ship were 15-inch and 11-inch ordnance. The ranges at which they fired were from 900 to 1,500 yards from the fort. Fort Sumter was built entirely of brickwork, only 5 feet thick about the embrasures, and at no part more than 11 feet thick. The armament mounted on the faces of the fort exposed to attack was as follows:—Four 10-inch, two 9-inch, eight 8-inch, two 7-inch rifled, six 42-pounder rifled

eight 32-pounders, and three 10-inch mortars. The engagement lasted two hours and a half, the vessels delivering their fire deliberately and successively, somewhat in the manner that our squadron proceeded in the attack upon Odessa in 1854. The "Ironsides" was obliged to retire in 45 minutes, and the "Keokuk," a two-turreted Monitor was sunk by a 117 lb. shot from a 7-inch rifled gun 1 hour and 40 minutes after the commencement of the action. The area of that part of the work exposed to the fire of the ships was 8,000 square feet. It appears that out of about 83 shots fired at the fort, at an average range of about 1,200 yards, 58 struck; and that in only one case did three shots strike near the same point. Fort Sumter was, however, quite serviceble at the end of the naval action. It was, however, subsequently destroyed by a long-continued fire from land batteries, it not having been constructed to resist an attack by artillery on the land side. Now, applying the experience gained at Fort Sumter to the case before us, the area of the fire was 8,000 feet, while the area of this shield, including the embrasure, is 96 feet, and that is about 1-80th, and the number of shots fired from the ships that attacked Fort Sumter and which struck was 58. This was over an area of 8,000 feet, so that if you draw an analogy from that case, not one shot would have struck the shield. But, not to push the analogy too far, probably the shield would not at the present time be subjected to a greater trial in action than it went through the other day at Shoeburyness.

36. (*Colonel Adye.*) When these shields were sent out to the two most important places which have been mentioned, were they intended as a protection for very exposed batteries?—Yes; they were intended for some most important points in the existing works, but not the most important, for some of these were left for larger guns, 23-ton guns. I may state that at Gibraltar part of the plan with which these shields were connected was to have an advanced work 800 yards out in front of the fortress, built on a shoal in the sea.

37. Should you consider, if these shields were intended for exposed situations, that they would be sufficient for important positions, looking at that section?—I consider that with the additional protection that would be afforded by a rope mantlet of proper construction behind—for you would always have the protection of that, or some other means to catch nuts of bolts that might be broken off,—that so far as these two shot were concerned, the gunners behind would have been as safe as we are in this room; in fact, it is not merely that I consider it so, but I state it is a fact that they would be so. Both shots are sticking in the shield, and as to the bolts, if any nuts were to fly out behind, they would be caught by a strong rope mantlet.

38. Do you consider that that shield is satisfactory and efficient for the defence of the gunners in an exposed place?—I consider that that shield gives the protection which I have previously alluded to against the fire of such guns as are now carried by the navies of European Powers within such range as the ships are at all likely to approach.

39. You have spoken of political and other considerations; provided you had more money and more time, should you be prepared to send out stronger shields to particular places after seeing the experiments which have been made, or would you before have done so?—The political considerations which I mentioned had reference to the time.

40. Supposing you had had more time and more money, should you have preferred to send out stronger shields?—If money were no object, of course it is very easy to make shields of any strength. If time had not been an object, of course we would have made one and fired at it; we should have been able then to form a judgment whether it was desirable to strengthen it or not. The construction adopted, as I have already stated, enabled us to give additional strength at any time, if desired.

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41. The shields were in point of fact hurriedly made and sent out for the reasons you have given?—Yes; for the reasons I have given; they had to be provided in a definite and short period.

42. To what particular causes do you attribute the weakness which has been shown in the shield by the effect of that one shot [pointing to the section], entirely to the bolts, or chiefly so?—Chiefly so. If you were to put in more iron, the effect upon the shield generally, of course, would be less.

43. Do you think that it would be so if you used the same bolts?—*Cæteris paribus*, if you put in more iron, the resistance of the whole shield would be greater, and probably less effect would be exerted upon the bolts.

44. (*Chairman.*) But the question put refers to the shearing action upon the bolts, and whether you believe, supposing another plate had been added, or thicker plates had been used, the shearing action on the bolts would have been the same?—I think that that is a thing we cannot well tell until we have made further experiments.

45. (*Colonel Adye.*) Do you consider that the failure of the shield was more especially due to the bolts?—I am disposed to think so, and of course the failure, if failure it is to be called, would be much less if you added more iron to it; but that is a question of money. There is no difficulty whatever, if you are prepared to pay for it, in having any amount of iron in them. The Russians have, I believe, had a shield for three guns (with intervals of only 14½ feet between each two guns) constructed, at a cost of more than 3,000*l.* per gun.

46. (*Colonel Ward.*) It appears to have failed partially in two ways?—Yes; the one in question being supposed to be the amount of iron that was used.

47. (*Colonel Adye.*) After two shots so many bolts went, and I would ask you whether you do not consider that the breaking was really caused by the weakness of the bolts?—I think it probably was so caused, but I may mention that the shot struck near the weakest point, or near that junction [pointing to the section], thereby showing, what I before alluded to, the desirability of not having more joints than you can possibly avoid.

48. Was there any washer on the bolts?—Yes; an indiarubber washer, half-an-inch thick.

49. (*Dr. Pole.*) Is not this part of the shield [pointing to the section] practically destroyed or rendered inefficient by the shot; or is it not so far damaged that another shot striking near the same place would cause absolute destruction to anything behind?—You cannot tell that except by experiment.

50. Must not a shot striking within 2 or 3 feet of this [pointing to the section] be so destructive as to render the place uninhabitable, so that *quoad* this part of the shield, and for a certain area round

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it, one shot has rendered it inefficient?—It has, no doubt, weakened it.

51. Would not utter destruction be caused if another shot were to strike within 2 or 3 feet round this spot [pointing to the section], with all these pieces in so loose a state?—As I stated before, so far as the fragments of bolts, &c., are concerned, they would be caught by the rope mantlet behind.

52. Would not a shot cause these plates to fly to pieces, scattering them in all directions?—I think not. Such small bits of plate as would be likely to be driven in would likewise be caught.

53. Within what distance do you think hostile vessels might come?—I think you might keep them away by torpedoes at a considerable distance from the place.

54. But that would be resorting to rather unusual means, would it not?—Not at all; it is one of the most important means of protection that we have for our harbours and seaports now.

55. Might we not assume that at Gibraltar or Malta vessels would come within 200 or 300 yards?—I think not; if you had torpedoes 400 yards out, they would keep them from coming in so near.

56. Would it be certain, do you think, that you would be able to prevent vessels coming within 400 yards?—I think so.

57. Then take a distance of 400 yards; is a shield of such dimensions a difficult object for a vessel with good guns to hit?—I just now gave you a statement respecting the naval attack on Fort Sumter, showing what actually occurred in action there, and how very small a number of shot would probably hit any given point of a shield.

58. (*Colonel Adye.*) At what range did the firing take place at the attack on Fort Sumter?—1,000 yards.

59. (*Dr. Pole.*) I am speaking of vessels coming within 300 or 400 yards; and is all we have heard about the accuracy of our best rifled artillery to lead us to suppose that it would be difficult for ships armed with such guns, and coming within 300 or 400 yards, to send shot with tolerable certainty into embrasures?—It is found that in a naval action all your accuracy on board a ship is most seriously interfered with; in fact, when ships once come into action, I fancy it would be of very little avail. The fire from a ship, more especially during an action, in a cloud of smoke, cannot be directed with that precision which can be obtained from a land battery.

60. With regard to the manufacture of these shields, does the War Office or your Department order them, or superintend their construction?—They superintend their construction, they have an officer, Colonel Inglis, who has given great attention to the subject, and who, I believe, understands it thoroughly.

61. I am alluding to their manufacture. By whom are they manufactured?—They are made by contract, and the trial of the plates is carried on at Shoeburyness. Reports of the trials are made by the Superintendent of Gunnery, Colonel Wilmot.

62. How many of these shields have been made?—35.

63. Have they all been manufactured by the same firm?—Yes.

64. By what firm?—Messrs. Cammell and Company, of Sheffield; their tenders were something like 200*l.* under those of other firms.

65. How many firms sent in tenders?—The Millwall Company and the Thames Company, Messrs. Brown & Company, and all the great rolling firms sent in tenders, but the lowest tender was that of Cammell & Company.

66. How are these plates experimented upon, is one picked out at hazard?—They are taken at hazard from a batch of armour-plates.

67. That is to say, rolled plates?—Yes.

68. Were the plates tested by any process, or what kind of control was exercised over the quality of the plates?—They go through the same kind of test that the plates for ships do; they are fired at with a 68-pounder with a small charge of powder.

69. But the plates are taken out of a batch haphazard?—Yes.

70. By what process are they tested?—The following was the method first approved:—The sample plates were selected from those supplied by the contractor, and sent to Shoeburyness for trial. Each plate tested was to be simply set up against a bank of earth, or filled sand-bags, and re-adjusted after each shot. Plates of moderate thickness, that is from $4\frac{1}{2}$ to 6 inches, were to be struck by 68-lb. cast-iron spherical shot, from as short a range as the security of the gun would admit. A $4\frac{1}{2}$-inch plate was to receive at least three overlapping shot; a 6-inch plate at least five such shot; and intermediate thicknesses at least four. Plates of greater thickness than 6 inches were to be struck by cast-iron spherical shot from such heavier guns than the 68-pounder as may be available, and on the principle of overlapping so many shot as shall cause considerable injury to the plate. After these proofs each plate was to be struck by a steel or hard-metal rifle shot, just capable of penetrating. The gun and charge, in each case, to be decided on by the Commandant at Shoeburyness. The object of the proofs was to so injure and penetrate the plates, as to fully expose the qualities of the iron, and to test the completeness of the manufacture. The Commandant at Shoeburyness was requested to classify the plates into three classes, A, B, C, each class having three degrees, as A^1, A^2, A^3, &c. All class A to be very good, and require no further trial. Class B to include those not so satisfactory, and requiring further investigation. Class C to contain those unfit for service. This method of testing the plates was at first followed, but was afterwards modified, as it was found that resting the plates against the banks was inconvenient, and involved great loss of time. The plates were, therefore, suspended by chains from a horizontal beam, so as to be free to swing on the shot striking; and this system has been since pursued under all contracts. As a rule three cast-iron spherical shot from the 68-pounder, with a service charge, from a range of 30 yards, followed by one or more penetrating chilled shot from the 7-inch rifle gun, with charges varying from 9 lbs. to 13 lbs., were found sufficient to test the plates up to a thickness of $5\frac{1}{2}$ inches. The qualities were determined by the buckling and indentation caused by the first 68-pounder shot; by the effects on the rear of the plate, caused by two or more of these shot; and by the nature of the fracture when the shot at last broke through the plate. The resistance to penetration was shown by the chilled shot from the rifle gun.

71. What is known about the quality of the plates?—The quality of all plates that are tested, is recorded. If I recollect right, the test plates for the shields under discussion are put down as A 1,

72. (*Colonel Ward.*) Did I rightly understand you to say that our 9-inch gun is more powerful than any gun used by any foreign power?—So I am informed.

73. Is it more powerful than the 15-inch American gun?—Yes; with 60 lbs. of powder, as the charge of the latter.

74. (*Chairman.*) You have used the words "plank" and "plate" relatively?—I say that they are not interchangeable.

75. Can you give the Committee any definition or will you explain where you consider "plank" to terminate, and "plate" to begin?—What I was thinking of when I spoke of the "plate" as distinct from the "plank" was that in respect of the question before us, where we have a plate 4 feet wide, the large superficies without joints of course gives you a greater amount of additional strength.

76. Do you draw the line of distinction at any given area between "plank" and "plate"?—The distinction is more one of width than area. What I have in my mind is that the plank is about, say, 18 inches wide.

77. Without reference to length?—Yes.

78. So that all beyond 18 inches you consider plate"?—You cannot lay down arbitrarily any width which would mark the line where the "plank" ceases and the plate begins. One condition for the plank, when used for exterior armour, must be that it is not too wide to permit of its being properly secured by one row of bolts. In the case of iron shields, which is that now under consideration, the width of the planks must vary according to the superficies of the shield and of the embrazure opening. For instance, if the shield be 12 feet wide and 8 feet high, and the port 2½ feet wide, the width on either side of the port will be 4 feet 9 inches, and to cover this, three widths of plank will be required, each 1 foot 7 inches wide (*vide* fig. 6); if this space were

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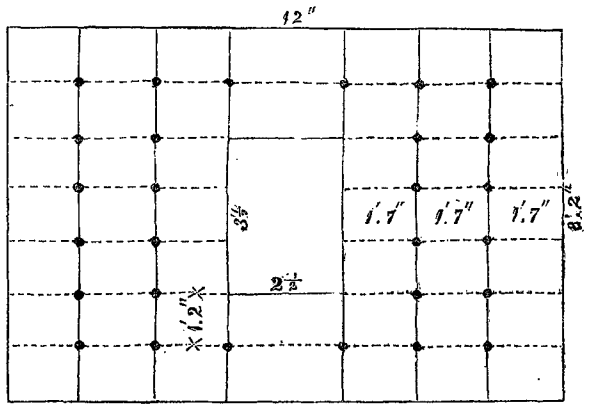
Fig. 6.—Shield of planks in two layers, the dark spots show lines of weakness through the shield.



covered by two widths, they would be rather plates than planks. Again, upon the height of the port and, its position, will depend the width of the spaces if covered by horizontal planks. In the case before us, the port being 4 feet high, the sill 2 feet 7 inches above the ground, the planks would respectively be 1 foot 3½ inches, 1 foot 4 inches, and 1 foot 8 inches wide.

(The witness withdrew.)

Lieutenant-Colonel THOMAS INGLIS, R.E., examined.

79. (*Chairman.*) There are three points which have been submitted to this Committee, but we wish to direct your attention to-day to this, how far the trials which have been made of a sample of the shield sent to Gibraltar and Malta were unfavourable to the shield, and secondly, what were the causes which led to any failure in the shield; whether the reasons for such a mode of construction were financial; whether it was the best thing you could recommend for the purpose, having regard to the places where it was to be used; or whether, with recent experience, you would in future adopt certain modifications as to thickness or otherwise?—I have not prepared any statement upon this subject, thinking that you would prefer to bring out my evidence by questions, but I can, if you please, in a few words describe what I know about the shield.

80. Have the goodness to do so?—In the latter part of last year I was called away from my ordinary duties, and ordered to take up particularly the subject of iron fortifications. I was first told to prepare a design for a shield for open coast batteries. For a long time my principle has been to adopt what has been called the plank-upon-plank system, but on this occasion I was precluded from adopting that construction, for two or three reasons; one was, that I knew if such a construction were adopted, the manufacturers would not be prepared to go to work at once and turn out shields within the period some were then required. I also thought that the adoption of heavy planks for the face of the shields involved questions of manufacture which required more consideration than had yet been given to them: that is to say, I thought it likely that manufacturers would meet with delays to begin with in making planks as heavy as I wanted them. I therefore thought it unwise to trust to that system upon this occasion, which was rather a pressing one. In further considering the matter, I drew up many different plans for using iron in the forms which we were more accustomed to, knowing that then there would be a good many firms to which we could go for tenders. At last it was determined to use ordinary armour-plates, and I thought it would be best to do with them what we had before done with the planks in the shields tried at Shoebury: that is, to cross and re-cross them. Then, as the struts which we had already tried had answered very well, and the floor beams and sills by which to secure the shields ultimately to the masonry and hold them down to the floor were good, I adopted them. Then, as regards the planks which on former occasions formed a sort of framework at the back of my shields, as I could not go into the subject of planks at all on this occasion, I thought we ought to use some form of girder which was in the market ready to be worked with. I preferred the H form, for certain reasons, to others, and that led to the adoption of a skin, because there would otherwise be no means of making a proper connection between those H-girders and the heavy armour. The exact thickness of the shields I did not feel was quite within my power to control. There were considerations of expense introduced to a certain extent, and we ultimately thought that a 12-inch shield, with every facility for adding to it at any time, would be consistent with the strength of the adjacent work and the

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general character of an open coast battery. Tenders were invited from five or six of the principal firms in the country, and Messrs. Cammell and Company, of Sheffield, obtained the contract. The first contract was for 20 shields, and in the course of its progress the number was extended to 15 more, making 35 in all. The work proceeded, under my superintendence and inspection, at the works. Tests of the materials used were carried on in machines in London and Woolwich, and the proof of the armour at Shoeburyness. On the whole, I had reason to be pleased with the material which was supplied by the contractors. The armour was classed by the Proof Officers as A 1 on each occasion. The other material, which was tested, seemed good, so far as we could judge with the means which we had at our disposal.

81. Including the bolts?—Yes, so far as the tests indicated. It would be a long story if I were to recapitulate all the tests and results, but I should like to mention some.

82. If you desire to add it to your evidence, you can do so?—I have said that the armour-plates were all classed A 1. The next I wish to mention are the tests of 3-inch bolts. I had a bolt tested at Messrs. Kircaldy's, and it gave 49,948 lbs. as the ultimate tensile strength of the iron, with a reduction of area at the point of fracture of 37·8 per cent., and elongation 29·4. That was corroborated by tests made in the Arsenal at Woolwich (three different tests) where we got upon this 3-inch bolt iron 22·9 tons breaking strain, with a yielding point, that is the point at which the elasticity was overcome at 11·8 tons, elongation 27·25 per cent. Another one tested gave 23·9 tons breaking weight, 11·5 tons yielding point, elongation 33·15 per cent. Another one tested gave 23·5 tensile breaking strain, 11·4 tons yielding point, and 23·1 per cent. elongation.

83. Proving the iron to be of good quality?—Indicating the iron to be what I wanted it, namely, of good strength and elasticity, which is shown by the reduction of the area, or the elongation.

84. You mean its ductility?—Yes; from that experience I certainly judged the iron to be good.

85. You found it to be what you wanted?—The results led me to suppose so. There were certainly two qualities of iron used in the bolts of the shields. One was a quantity which was made by Messrs. Cammell themselves; and there was another branded Staffordshire crown iron, which was tested amongst those which I mention now.

86. (*Dr. Pole.*) You mean the iron called "S. Crown" iron?—Yes; I proved some of this iron.

87. (*Chairman.*) When was it decided that it was necessary to make these shields; when did you receive your instructions?—I do not know when it was decided to make these shields, but I received my instructions about the middle of October, 1866.

88. How long after the shields were ordered, and you received instructions, did you prepare the designs; was it before the contract was taken?—I cannot tell the precise date from memory, but I know that tenders were received on the 15th of November; the first acceptance is dated 26th of November, 1866.

89. How long was it from the date of that acceptance of those tenders to the production of the shields, the delivery of the first 20?—They were delivered singly; the delivery commenced, I should think, just about the close of March, and then for two or three months, or perhaps four months, the delivery went on steadily.

90. As soon as the first shield was delivered what was the course adopted, was it shipped at once and sent out?—No; they were shipped in batches.

91. The first shield, as I understand, was delivered in the month of March?—It was delivered about the end of March.

92. When was it decided to make any experiments on the shields by firing at them?—It was only decided in about August.

93. What was it that gave you such confidence in them that you did not take the usual course of making experiments by firing at them?—I should have much preferred one being fired at early in the contract.

94. Had you reason to be satisfied with the various tests to which the several parts of the shields were subjected in the course of construction; did you feel convinced that they were of good construction and good material, and therefore there was not the ordinary necessity for testing them by firing at them with shot, or would you have still preferred that one of them should have been tested by firing at it?—In the very early stages of the contract I should have much preferred that one of them should have been fired at.

95. When did the first shipment of those shields take place?—I cannot speak positively without notes, but I can supply the exact dates and numbers. I think the first shipments were seven for Gibraltar and seven for Malta, but I will supply that exactly.*

96. Having seen the result of the firing which took place in October, are you satisfied with the construction of those shields, or would you like to improve them?—As to the general principle of the construction, that is, solid armour crossing armour, I think it is very good indeed. I admit that where a joint comes it will be a source of weakness; but there are some such points inherent in all principles of construction. If I thought that the shield was to be proof against a heavier gun than the 12-ton, I should prefer seeing more metal in it.

97. It has been already stated officially, I think, in Parliament, that it is the intention of the War Office at once to proceed to strengthen those shields?—I did not know that. I have been asked how I would do it, and I have pointed out a plan which agrees very closely with that which we had in view as a method of adding strength to such a shield in the original design.

98. Will you kindly describe the mode?—I think that altogether the simplest thing would be to put on another thickness of armour-plate between the 5 and the 5½.

99. What thickness would you recommend for that purpose?—That rests so entirely with those who have to speak as to the nature of the guns to be resisted, that I feel it is scarcely within my province to answer.

100. You may remember that in the first trial of a shield called by your name in 1862-63, it was stated by the Iron Plate Committee, in their Report, approving, as they did, of the construction of the shield that they yet recommended as against this class of gun, that the plates should be at least 7¼ inches in thickness?—Yes.

101. Can you state to the Committee why, on this occasion, you adopted a thickness of 5½ inches, having had experience before of the probable advantages to be derived from a 7¼-inch plank?—I

* 8th August, 1867.

do not know whether I misread or misunderstood the Report of the Committee, but my impression has always been that that paragraph referred solely to planks, and I quite agree with the Committee, and would not, on the face of a shield intended to resist heavy guns, use planks of less than from 7 to 8 inches in thickness. I do not think it applies in the same degree to broad armour-plates.

102. Would you prefer a $5\frac{1}{2}$-inch armour-plate to a $7\frac{1}{4}$-inch plank to cover the same given area?—Do you mean both with solid backing?

103. I mean both with the same backing?—I should prefer its being a little more than $5\frac{1}{2}$ inches. I do not think that armour-plate need be, if it has solid backing, of the same thickness as a plank.

104. Do you think that the $5\frac{1}{2}$-inch plate which was placed on the Gibraltar and Malta shields was as good a resisting medium as the same shields would have offered had they been covered with your planks of $7\frac{1}{4}$ inches thick?—Not quite.

105. (*Colonel Adye.*) Were those shields intended for exposed places, and looking at that section do you now consider them strong enough for exposed places?—I should like a little more metal in them, that is, a little more thickness.

106. Do you consider that the trial has been rather unfavourable to the shield as a matter of experiment, or do you think that it has stood as well as you expected?—I should like to see another shot before I answer that question; the spots where the two shots struck were on joints in the second thickness [pointing to the section]. A shot striking elsewhere would have less effect.

107. Do you think that the unfavourable result as to those shields was on account of the iron or defective bolts?—The bolts giving way was certainly a defect and a serious source of weakness to the shield.

108. Have you not seen other shields of a different construction fired at in which the bolts stood better?—I have never seen bolts go in the same way before.

109. What do you think was the cause of the bolts giving way?—I was going to speak on this point. I had not come at all to the experiment.

110. (*Chairman.*) Then go on, if you please' with your statement?—I have nothing more to say about the shields until the day of the trial. The failure of the bolts on that occasion was the most marked feature of the trial; the resistance to penetration was nearly what I had calculated; but the failure of the bolts I was not prepared for, and I was, I admit, surprised; but by going carefully into the matter afterwards, I consider that we have arrived very closely at the cause of their giving way. One point is, that we have found that the Staffordshire crown iron, under a percussive blow from a weight falling with the velocity that a body obtains in falling 30 feet, is liable to snap, and, in fact, it gives way in exactly the same way as the bolts in the shield did; but the same piece of iron tested in the test machine gives different results, that is, it elongates or draws out, and breaks fibrous. One of the bolts of this iron, taken from the surplus stores of the contractors, did give way at Sheffield in precisely the same way as most of those in the shield; whereas the iron of which the rest of the bolts was composed stood a great deal more work, and proved itself very much better under sudden strains. Looking closely to the effect upon the bolts that gave way on this occasion, we found that there was a nipping process, or shearing, which was not sufficiently met in the construction, and I have since, on a small scale, made a trial which I think proves that this shearing may be to a very great extent met by the method we are now adopting in this very shield, that is, the making of the holes in the second and third thicknesses of a larger diameter than the bolt, rounding also their edges, and filling in the space between with wood, so that, at any rate, the effect of the shearing must be very much subdued. The giving way of the H girders at the back of the point where the first shot struck would incline me to put on such a shield a greater quantity of metal in their back flanges, to resist the tension to which they are subjected under a heavy blow. I consider that the struts and the supports stood to their work in a very satisfactory manner.

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111. (*Colonel Adye.*) Is it your impression that want of time and want of money partially led to these shields being sent out weaker than you would have made them if you had had more time and more money at your disposal?—I do not think that time governed the strength, but it governed the nature of the construction.

112. I believe you had no time to make the experiments before you had to make the shields?—No.

113. Were you ordered to make a certain number of shields for a certain amount of money?—That was settled for me; I think that they were to be within a certain limit.

114. You attribute the weakness of the bolts partially, I think, to the defect of the metal?—Yes.

115. Do you think it was also owing to any rigidity or want of elasticity in the shields?—I think that some elastic body properly placed would have saved the fastenings.

116. Can you tell the Committee why that was omitted in these shields; was it for any particular reason?—I have been precluded from using timber in open coast battery shields, on account of the perishable nature of the material.

117. Do you think that a shield could not be made partially with a wooden backing, which could be renewed without much difficulty?—Perhaps it might.

118. Do you think that you could prevent the fracture of the bolts by other means?—I do.

119. By using different metal?—Yes; by using different metal, and by introducing an elastic material round the bolt.

120. And without putting wood into the shield?—Yes.

121. You mean by giving a little play in the holes?—Yes; and by having elastic washers, on the back, of indiarubber or other material.

122. Would you be disposed to put more now?—Yes; I think it is desirable to put more.

123. (*Dr. Pole.*) What was the nature of the difficulty you met with in making your planks, that led you to abandon them?—Principally the time taken in making the rolls, which might have led to considerable delay. No manufacturer could have gone to work within two or three months, and I was ordered to have 20 shields ready by the end of the financial year, that is, by the end of March. The making of new rolls is a thing that cannot be done very quickly. I do not pretend that I possessed at that time the knowledge about planks that I do now; but I may say that I did think it was a sort of manufacture that no firm could go into at once, without experiment, and with certainty of success, which was necessary,

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if these shields were to be made within the few months allowed. The result of our recent experience is, that the manufacturers have not been able to turn out their planks to begin with, nearly so fast as I originally thought they could.

124. (*Chairman.*) What were the kind of planks in your contemplation, which you believed would have taken such time to prepare?—I had no design worked out in detail.

125. Is it the case now in the iron trade, that there would be a difficulty in obtaining planks $7\frac{1}{4}$ inches think, by from a foot to 18 inches wide, and 12 feet long?—There would be considerable delay in getting them to turn out the first set of planks of proper quality.

126. Have you made any inquiries upon the subject?—Yes; I have spoken to many manufacturers on the subject.

127. (*Dr. Pole.*) Colonel Jervois has told us of some experience that has been gained as to plates thicker than $5\frac{1}{2}$ inches; have you seen any of those trials?—Yes; I have seen all those experiments which have been tried at Shoeburyness.

128. Have any results been obtained, of a trustworthy kind, as to the inefficiency, or proportionate inefficiency, of a greater thickness?—I do not think that any of a greater thickness than 7 inches have been thoroughly welded.

129. By whom have plates of a greater thickness been made?—I have in mind several firms.

130. Have there not been some tried for ships' armour of considerably greater thickness, which have succeeded pretty well?—The "Hercules" plates were thicker; and there is one target at Shoebury called the "8-inch Warrior"; the plates are of good material, but they are not thoroughly welded.

131. What is your opinion as to the present prospect of increasing the thickness of the plates beyond $5\frac{1}{2}$ inches; do you entertain any hope of getting, say $6\frac{1}{2}$ inches of plate stronger in the proper proportion, as the square of the thickness, and say 3 feet wide?—Yes; I think so. Up to that I should say they can be turned out perfect in every respect.

132. (*Colonel Adye.*) Were there not several plates 7 inches thick tried at Shoeburyness which did not give way on account of the imperfect welding?—Yes; there was one specially good 7-inch plate, but it was made for experiment; and such plates should not be taken as a specimen of the general manufacture.

133. (*Dr. Pole.*) You have spoken of them not being properly welded; but you are aware, are you not, that rolled plates are very seldom thoroughly welded?—I do not think it should be so.

134. It is a fact that rolled plates are almost all laminated?—Yes, they were at first; but they are making them now so that they are not so. Up to a certain thickness, we do get them thoroughly welded. I have seen thicker plates thoroughly welded.

135. You would not have much confidence in this part of the shield [pointing to the section], if it were to sustain another blow within a circle, say, of 4 or 5 feet diameter round this point. Has not the shield been rendered inefficient near that place by that single shot?—For a certain area, certainly.

136. Would you not think it right to contemplate the possibility of a shield being struck by several shot from an attacking ship, and would you not think it advisable to prepare for a shield being so struck at different points within a short distance of each other?—Yes; so as to bear several shots within a small area.

137. It would be desirable, I suppose, to try this [pointing to the section], by firing at it again after the bolts were properly made?—Yes; I do not consider that the trial has come off at all; that of the 25th of October was only a preliminary trial.

138. I presume you would not think men perfectly safe behind this [pointing to the section] if there was a probability of its being struck again at the same place?—No; if it was very near to that spot I should not, but the men would have been perfectly safe on this occasion, for there was a thin rope screen, not half the thickness of a common mantlet, and any one would have been perfectly safe behind that during those two shots. When one speaks of several shots striking within a small area, it should be borne in mind that there is a great difference between shot aimed exactly perpendicularly to the surface, as these were, and shot striking, as they would, in actual service, at various angles, so that I consider you might have possibly 20 12-ton gun-shots on that shield in actual service, and not one of them would have the effect of either of these two.

139. (*Colonel Ward.*) I understood you to say that the resistance offered by the shield, apart from the girders and the bolts, was just as great as you expected?—The penetration was just about what I expected.

140. Are we to infer from that that if you had good bolts and stronger girders the shields would answer in every respect for the places for which they are required?—Yes, with slight additions; until foreign navies have guns that would hit harder than ours.

141. Would it be sufficient for a 9-inch gun?—I think it is equal to the adjacent parts of the works.

142. If you were to get good bolts, and somewhat stronger, would the shield, generally speaking, be strong enough for the rest of the work you intended it for?—I have always wished that there should be an inch or two more of iron.

143. You think that the shield is not quite strong enough?—Yes; I should prefer an inch or two more of iron.

144. If you came to strengthen the shields by adding to their thickness, would you do so with iron or with wood?—I should prefer for various reasons to strengthen them with iron.

145. Do you mean in front?—Yes; something analagous to that [describing].

146. Can you state to the Committee what would be the cost of making the shields as strong as you would now desire them to be?—Roughly, 150*l.* a shield.

147. (*Chairman.*) What additional strength would that give you?—About 3 inches of iron.

148. (*Colonel Adye.*) You stated that you thought that the shield might be equal in strength to the adjacent parts of the works in which it was placed. Is it your view that an iron shield is sufficiently strong if it is equal to the adjacent part of the works?—There should be some consistencybetween the two.

149. Supposing that the adjacent works were made of granite, which was very much pounded by the new guns, would it not be very advisable to have the shield of such a strength that the gunners and the guns should be protected with-

out reference to the crumbling of the parapet?—If the masonry were crumbled away, the men would of course not be safe.

150. Considering the shield as a great iron box in which there is a gun, and that the purpose of the battery is to protect the gunners, would you limit the strength of the shield to that of the masonry?—I do not look upon the shield as being exactly what you say, a box for the purpose of making the guns and gunners safe. A shield, in the sense in which we are now speaking of it, in an open coast battery, is to act as a substitute for that part of the masonry which could not be sufficiently strong in itself; for a short distance right and left of the embrasure, you cannot possibly, with masonry, get up the required strength, so that you are obliged to introduce a shield for a certain distance until the masonry can be made strong enough, or, in other words, till there is space enough to get up the required strength in the masonry.

151. If a fort is a means of offence against an attacking body, the life of the fort is the gun; if that strong box will hold out, even if the masonry is almost crumbled to bits, you may still have the gun effective?—Yes.

152. (*Chairman.*) It has been stated that the shield fired at at Shoebury did not accurately represent the shields sent to Malta and Gibraltar. Can you explain whether there is any truth in that statement?—The shield fired at at Shoebury represents them accurately.

153. In placing that shield *in situ* to be fired at, was more support given to it than would be given to its fellow shields in their proper places at Malta or Gibraltar, to which they were sent?—It had a good deal *less* support than it would have had in its proper place. *Lieut.-Col. T. Inglis, R.E.* 10 Dec. 1867.

154. Were there any additional struts at the back of it, or more than are to be found in a shield when placed in a fort?—No.

155. (*Dr. Pole.*) You have been asked whether wood would be of any advantage in breaking the force of the concussion. Is there any objection to using wood, and could it not be so contrived as to be safe from fire and easily renewed?—If it can be done without wood, I think it is desirable that it should be.

156. (*Chairman.*) On the ground of repairs?—Yes; I have never had written instructions on the subject; but my general instructions have been not to use wood in the shields.

157. You have spoken of the trial made at Shoebury by firing at the shield as having been merely preliminary, and I think you stated that you considered it merely as the commencement of the trials. Has any arrangement been made for any further firing upon that shield?—No; not that I am aware of.

158. Is it in a condition to be fired at still?—It will be in a very few days; we are now putting in the new bolts.

159. Not new plates?—No; it is the same shield, with merely new fastenings, and it will be ready in a few days.

160. (*Dr. Pole.*) Have you ever tried the plan of counter-sinking the edges of the holes in order to prevent the shearing of the bolts; that is a plan which I have used in railway construction with great success?—The edges of the holes were partially rounded before the late trial, and we are now adopting this plan more extensively.

(The witness withdrew.)

Adjourned till to-morrow at two o'clock.

Wednesday, 11th December, 1867.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Chair.*

Major-General Sir WILLIAM GORDON, K.C.B., R.E.	Lieutenant-Colonel WARD, R.E.
Colonel ADYE, C.B., R.A.	Dr. PERCY, F.R.S.
	Dr. POLE, F.R.S.

Captain HARRISON, R.A., *Secretary.*

Brigadier-General JOHN H. LEFROY, R.A., F.R.S., examined.

161. (*Chairman.*) You are aware that this Committee has been appointed to obtain some information with regard to the so-called Gibraltar shield; how far the trials made were unfavourable to it; what were the causes which led to any failure; and what changes in the construction it would be advisable to recommend?—Yes. *Brig.-Gen. J. H. Lefroy, R.A., F.R.S.* 11 Dec. 1867

162. When you became aware that the War Office had decided on constructing these shields, were you consulted as to their construction before the contract was made?—No; the Ordnance Select Committee was not consulted, nor was I personally consulted.

163. When had you any cognizance that these shields were about to be used for the purpose of defending the guns at Malta and Gibraltar; I mean officially?—Without being precise as to the date, I should say about six weeks before the trial took place we were told that one of these shields was to be sent down and tried; and I then heard what I was not aware of before, that a number of them had been delivered in Woolwich Arsenal during the summer months, but as they were deposited in a place to which I did not often go, I was not aware of it.

164. Have you any knowledge whether the shield sent to Shoeburyness for trial accurately represented the shields about to be placed at Gibraltar and Malta?—No; I have no knowledge upon that subject.

165. What instructions were given to you as to the trial of the shield, or officially to the Com-

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mittee?—The instructions given to the Committee were that they were to test the shield with a 9-inch rifled gun, a 10-inch rifled gun, and a 15-inch smooth-bore gun. I speak under correction, but I think I am correct in saying that they were to test the shield with those three guns; but shortly before the trial it was intimated to me that the Director of Works wished the first practice to be considered as preliminary and private; that it was merely feeling the way, as it were, to the resistance of the shield; and although other guns were set down, only the 9-inch gun was used for that purpose. We were told that the charge was to be reduced so as to strike a blow equivalent to a distance of 400 yards; this involved a reduction from 43 lbs. to 37½ lbs. As I have stated, it was quite understood by the Committee that the two rounds fired on the 25th of October were not to be regarded as a trial of the shield, but merely as a preliminary test of its strength.

166. From your knowledge of the resistance offered by iron defences, do you anticipate any great resisting power from the shield when exposed to a 9-inch gun at a distance of 400 yards?—Yes: that is to say, I do not think that a shot from a 9-inch gun, at 400 yards, would go through the shield; I mean individual shots; by an accumulation of shots on or near the same spot, you can of course destroy anything.

167. Can you now state to the Committee how far you consider the trial by two shots was unfavourable to the shield?—The conclusion suggested to my mind by the trial is, that the disposition of the iron is not the most favourable, considered in reference to its quantity. I think that it is very questionable whether the 1½-inch plate behind, which receives the greatest amount of extension from any buckling which the shield gets, is the best place to put the plate in. It is evident that this plate [pointing to the section] has been torn aside, not by a direct blow, but by the extension it has met with; it has been rent in that place [pointing to the section]. I therefore think it is questionable whether that is the best place in which to put a 1½-inch plate. With regard to the girders, I thought at once that the H-iron girder is not a favourable form for resisting a sudden blow; and for this reason, that the web is very thin, and any buckling that the web gets tends to tear it near the flange. On the other hand, the rear flange is also very thin, and tears by a sudden blow easily, as actually happened. It therefore appeared to me that the disposition of the iron in the H girder would have been better if it had been in the form of a T girder, and not an H girder; with the web thicker, and not so deep, because the deeper you make it the greater its tendency to tear from sudden extension. I would give a rounded or clubbed form to the foot of this T girder. That strikes me as being a better form; the Committee will see by the photographs that the H girders, where they were struck by round No. 1,469, rent at once asunder, because the extension of that part is very considerable.

168. Do you consider that the mass of iron used was sufficient for the duty these shields were intended to perform?—It is so difficult to form, in one's own mind, a criterion or standard of the attacking force. I am a disbeliever in the Americans ever using habitually 100 lb. charges with their 15-inch guns. I am aware that the Russians have the same gun, but they think that 45 lbs. of powder is the proper charge. The Americans for a long time used only 35 lbs. of common powder, or 50 lbs. of cake powder. I believe they have made it 60 lbs. now, but that they never can, with any prudence, use 100 lbs. of powder. I do not say that it may not be done now and then, but not habitually; and but few shot that will be fired with it will hit so direct as the shot in this case has done. I believe that, as against a shot from a 15-inch gun, with a 60 lb. charge, the shield is strong enough to afford substantial security. I do not say that the shield is not to be destroyed, but I say that it is strong enough to give substantial security; and I should be happy to take my chance in serving a gun protected by this shield.

169. Do you think that the strength of the shield should bear any relative proportion to the strength of the parapet, or should you regard it entirely as an isolated means of defence to protect the gun itself?—I think that it should be considered as an isolated means of defence to protect the gun itself. I consider that the shield is always very much stronger than the parapet, and that the fire would generally be concentrated upon the shield, as far as concentration is possible in actual action; and, upon the whole, I think it would receive a greater proportion of the blows than an equal area along the line of the parapet. The men placed there require greater protection.

170. You do not look upon it merely as an additional work to strengthen the weakest part of the fortification at the embrasure, but as a protection for the gun and protection to the gunners?—Yes; I look upon it in that light.

171. That being so, and there being no limit to the weight which shore defences can carry, is it desirable to limit the amount of iron to be used for the protection of the gun and the men to a quantity slightly more than would be equal to the defence of the work against such guns as might now be brought against it?—Certainly not, unless the thickness of the iron is limited by other considerations, such as cost; but I would rather have 20 guns on an extended position defended by this shield than half the number defended by a shield twice as strong and twice as costly.

172. Then it is rather with regard to financial considerations than with regard to any other considerations that you would consider this a sufficient protection?—Entirely so; I should greatly prefer having a shield 2 or 3 inches thicker. I am merely supposing that there is a limit on that score, and that this shield affords real and substantial protection. The Committee are aware that the gun was aimed dead true, strictly perpendicular to the shield, and from a very short distance on the same level, a condition which never arises in practice. If the gun had been fired obliquely, and the shot had so struck the shield, I think we should have had no question about the sufficiency of its strength.

173. I suppose the question of repair would hardly enter into consideration; but might it not be supposed that a stronger shield would require less repair, and would afford more protection than a thinner shield would, which, subjected to the action of shot from heavy guns, must be renewed, perhaps entirely, after an attack?—The renewal of a shield of this description is one of those things which does not appear to me to be probable. I take it that any action in which shields of this kind are used will be short, sharp, and decisive; one side or the other will be sure to get the worst of it, and the attack will be not likely to be renewed in a hurry.

174. The gun would protect the shield and the gun-carriage; but, in your opinion, would a slight additional outlay which would make the shield very much more capable of resistance, looking at the cost of the whole material, be undesirable with the view of making the whole more perfect?—No; I think it would be desirable. It is one of those questions of finance which, without knowing the limits both of the purse and the demand upon it, it is difficult to express a positive opinion upon. The shield costs a little under 1,000*l.*, and if you were to make one that cost 1,200*l.*, no doubt you would have a much better article, and the question simply is, whether you can afford to make the additional outlay required.

175. In addition to the cost of the shield, nearly 1,000*l.*, there is also to be considered the cost of the gun and the gun-slide which are behind it, to be protected, and which, no doubt, represent a much larger sum, or quite as large, as that of the shield?—They represent a rather larger sum. If you take a 9-inch gun, the gun, carriage, and platform together will cost 1,200*l.* as they are now made.

176. You think that by an expenditure of about 10 per cent. additional, you would get a very much better article?—Yes; by that addition to the total cost. The two items come out of different votes.

177. Would it be fair to ask you whether, if you were entrusted with the duty, you would think it advisable to expend that additional 10 per cent.?—Yes; I certainly should think so.

178. Are there any remarks on those two heads—viz., how far the trials were unfavourable to the shield, and if so, to what causes the failure might be attributed, that you would like to make, in addition to what you have already stated?—I should like to call the attention of the Committee to a circumstance which operated in two ways, I allude to the simultaneous snapping of so many bolts; there are about half of the bolts gone. In the shield, altogether, there are 28 bolts, and I believe 13 of them are gone, or about half; but this operated in two ways. It caused a great amount of destruction to the entire structure from all the buckling and forcing asunder of the plates, which was owing to the snapping of the bolts, and it has given the appearance of a greater effect having been produced upon the shield than if the bolts had been of better quality, and had held together. On the other hand, the back plate has been forced away after offering very considerable resistance, for the shot has not gone into it as much as I think it would have done if it had been held tight against the front plate.

179. Was there any special reason why the bolts should have failed, for instance, from being screwed up too tightly, or was it from bad manufacture?—I am inclined to think that it was owing to the latter cause. It was stated at the time that the bolts were screwed up too tight, and so they were, but we eased them a little before the second shot, and I can hardly state that the power applied would have put any such strain upon them as to influence their breaking much; but from what I have heard from Major Palliser, whose principle was followed out in making the bolts, I believe that they were not made in a proper manner.

180. Have you any recommendation to make to the Committee as to any changes that it would be advisable to make in the construction of the shield in question, or of future shields?—I should, myself, on the next occasion, like to see the inch and a-half plate put between the two other plates, instead of being put behind. I think it would then give you its full value, and that it would not be torn away as we see in this section by the extreme extension it has been subjected to. I should like to take advantage of these girders, but to apply the strength of the girders in a better form, so as not to have them so deep in the web, but thicker, and the reverse end should, in my opinion, be of a rounded, or clubbed section. That is the only suggestion that I am prepared to make. As to the existing quantity of iron in this shield, of course, if fresh shields are to be constructed, I should go then at once for having a $6\frac{1}{2}$-inch plate in front, and a $5\frac{1}{2}$-inch plate behind; that, I think, would be really sufficient in practice against guns.

181. It will be found in the Report of the Iron Plate Committee that, for this special service, a plate of $7\frac{1}{4}$ inches was recommended. Are you aware that that was considered to be the only plate which could be fairly opposed to what was then called the 300-pounder, with a charge of 45 lbs.?—But how backed?

182. The shield was to be constructed by Captain Inglis, of so-called planks, which, I think, you may remember to have seen?—Yes.

183. The passage to which I refer is this: "It appears, then, that even a 15-inch shield, if constructed in three layers, 5 inches thick, could not long resist such a gun as the 300-pounder with large charges of powder, the initial velocity of the gun and the work done being so great that less than $7\frac{1}{4}$-inch iron will not resist it; probably, therefore, plates or planks of 8 inches thick are the least that should be used in a coast battery; planks of that thickness, backed with cast-iron or by a second 8-inch plank, would, it is conceived, offer sufficient resistance even to 50 lb. charges at short ranges"?—I have no doubt that the Iron Plate Committee at that time entered into the subject better than I have done now, and the figure which they gave, $7\frac{1}{4}$, would be preferable.

184. Would you like to change the figure now? As between 16 inches of iron in two 8-inch thicknesses, arranged plankwise, and $13\frac{1}{2}$ inches in plates of $6\frac{1}{2}$, $1\frac{1}{2}$, and $5\frac{1}{2}$ inches, I should, I think, prefer the former, assuming equal structural facilities: that is to say, that the planks are in some way as thoroughly united as the plates can be by good bolts; but this is to assume a great deal. I see that in the experiment you have referred me to, in April 1862, it was a 10·5-inch round shot, with the high velocity due to a charge of 50 lbs., that led the Committee to their conclusion; and as the 9-inch rifle shot fired with 43 lbs. strikes a harder blow at 200 yards, it must be at least necessary to provide as great resistance.

185. Have you, or the Ordnance Select Committee, had before them any other forms of construction for shields intended to be prepared by foreign governments for the protection of forts?—No; the Ordnance Select Committee have had none, but I am under the impression that a shield for one of the foreign governments was tried by Colonel Wilmot; I am not quite sure. It has been customary, where trials of that kind have been allowed, to have them conducted by the Superintendent of the School of Gunnery.

186. Have you anything further to state to the Committee?—I should just like to remark that, if the Americans are justified in using 100 lbs. of powder with their 15-inch gun, we are justified in using 60 lbs. of powder with our 9-inch gun, and

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60 lbs. of powder with our 9-inch gun will make it a much more formidable armour-piercer than their 15-inch gun. It will give it the same initial velocity, but it will be carried much further, from the diminished diameter of the shot, and it will give it greater penetrative power. However, feeling the difficulty of coming to anything like finality in these things, my opinion is, that we must not fix our minds upon what are mere possibilities, because, if we do, we must allow for possibilities on the other side as well. The Americans, like ourselves, are guided by prudential considerations, but the consequences which would result from an accidental burst would be so serious that, notwithstanding all that I have heard said, I do not believe they will ever use their 15-inch guns with 100 lb. charges on service.

187. (*Colonel Adye.*) I should like to know what you consider is likely to be the largest gun that will be used by ships of war against land defences; take any of our own, for instance, as a sort of criterion?—I think we have arrived at the limit, and gone rather beyond it, of manageability in the size of our guns. I very much doubt, on many accounts, whether guns even as large as 23 tons weight will long remain in use in the navy. I believe we shall see that a gun of 16 or 18 tons weight will be about the maximum gun used.

188. Of what calibre?—What calibre you will give to it is an open question, but I should say about 10 or 11 inches.

189. Bigger than the gun that was fired at this plate?—Yes.

190. At what distance would you expect a ship to engage a battery where such a shield was erected?—That is very much a nautical question, and turns upon the anchorage and tideway, and fifty other things. My own belief is, that ships will very seldom come within 500 yards of a battery, because, when a ship is enveloped in smoke, she cannot tell where she is drifting; and considering her exposure and the danger of running ashore, I cannot conceive her coming within that distance.

191. Do you consider that a small ship with a turret gun would be enveloped in smoke in an action?—Yes; a little depends upon the state of the wind and weather, but from repeated discharges, supposing the vessel has two turrets and two guns, the smoke would be sufficient to envelope her.

192. Looking at the section of the Gibraltar shield now on the table, after being fired at, do you think that that shield is likely to fulfil the object intended in its construction?—I have partly given a reply to that question already. I say that it does not afford perfect protection, and I hardly know what would be considered perfect protection; but that it affords a measure of protection sufficient to justify the erection of the shields there is in my opinion no doubt, although they would be better if they were stronger.

193. You stated that you considered its failure was to be attributed to faulty construction; was it mainly the faulty construction or weakness in the bolts that produced the results we have seen?—I considered the shield tested as a given arrangement of 12 inches of iron in three plates, and in that respect I considered its construction as faulty, from having this $1\frac{1}{2}$-inch plate in the wrong place. I should have stated before that where these two plates [pointing to the section], the one vertical and the other horizontal, intersect, there is a relatively weak point; and that weak point would, in my opinion, be a good deal strengthened if the joint were broken by a 2-inch plate coming in between the two other plates in this shield. The principal failure in the shield as to structure, I think, arose from the bolts. I have seen a great many structures of the kind, which have been fired at, but I never saw bolts give way in this manner before; it is a very unusual thing. The first discharge brought the heads off seven, and the next discharge off six; we thought at first that it might have been due to the double nuts, which were excessively heavy, and the inertia of the bolt; with this very heavy weight of the double nut at the back of the bolt, washer and all, the sudden shock would tend to tear the bolt asunder. We took off one of the nuts from two of the bolts, but they went, like the rest, in a peculiar way, just behind the head; whereas our usual experience of bolts is that they go at the nut; and this was sufficient to show that there was something specially due to the bolts in the failure. Then, again, in consequence of the bolts being in immediate contact with the iron, there was a shearing force laterally, brought to bear upon them at the same moment that the force of extension was brought to bear there; and that, I think, should be guarded against in any future construction of shields.

194. Can you state roughly what thickness of shield you think could be used without detriment to the working of the gun; that [pointing to the section] is about 12 inches; would there be any objection to going to 20 inches?—I do not think so. The opening would have to be made a little larger behind, but not to such an extent as to make the shield perceptibly weaker, and any inconvenience might be guarded against, as far as the length of the gun was concerned, by making the muzzle a foot longer; but I do not anticipate any inconvenience on that score with the muzzle-pivoting guns.

195. Do you object to wooden backing, or do you not think that they might have saved the shield partially?—My only objection to wood is on account of its being perishable; it forms an admirable cushion, and had the shield been backed with wood, the concussion would have been less, and the bolts might not have broken so generally as they did.

196. Would there be any difficulty in backing the shield with wood, putting a thin plate over it, and renewing the wood from time to time?—No very serious difficulty. I apprehend that it would not want to be done oftener than once in 10 years; the plates could be taken out; it is a mere question of manual labour, and I see no great difficulty about it.

197. When speaking of future constructions, you stated that you would be satisfied with $7\frac{1}{4}$ inches in the front plate, and $5\frac{1}{2}$ inches in the back plate. Should you think there would be an advantage in having the backing on Chalmers' principle with end-on iron filled up with wood?—Chalmers' principle has answered very well where we have tried it, particularly in the case of the shield that was inserted in the great casemate, which was on that construction entirely, end-on iron, between the surfaces of the plates, and it answered remarkably well, but it was a very costly shield. I think it cost about twice the amount of this one, but that shield showed an enormous power of resistance; it is a mere question of money.

198. Can you explain to the Committee why it cost so much?—The mode of construction was a complicated one, and the actual quantity of iron employed much greater. The shield was altogether 21½ inches thick, of which 15 inches were iron.

199. (*Dr. Pole.*) If a second shot were to strike this shield [pointing to the section] near to the place where it has been already struck, would it not break it into pieces, and cause great destruction behind, and would not the shield itself then become quite inefficient?—A second shot striking on the hole of the first probably would send it right through, but I do not believe that the total resistance of the adjacent parts would be found so very much diminished. I cannot say how much, without experience; but it appears to me that at a foot distance the front resistance would be nearly the same as if the plate had not been previously struck, and the previous hole remaining plugged by the shot, there would not be much greater facility for the lateral escape of the broken plate.

200. After such a fracture had been made in the shield as we see, would not a second shot break portions of it into fragments and drive them behind, and so do great mischief to the men behind the gun?—Their liability to injury would, no doubt, be increased, but a section of this kind rather exaggerates the appearance of looseness and openness in the whole structure; this [pointing to the section] is purely local, and if it were extended over the whole front of the shield, these spaces [pointing to the section] would become a good deal less than they appear now. I ought to have mentioned before that I neither saw at the time nor have I been able to ascertain by enquiry, that any of the bolts were thrown to the rear with dangerous violence. Very few of them, I cannot say how many, but I believe three, were thrown out at all, we discovered that the others were broken merely by moving them; but they remained in the holes. That being so, as to those that remained behind, it seems natural to infer that those which did not, did not jump with any great force. I should mention that there was a curtain of plaited rope, 1 inch thick, hanging up behind, and on examining that, I found that some of the strands had been a little roughened, but there was nothing approaching to a hole made in it.

201. Do you not think it would be right to provide, even allowing for the contingencies of smoke and instability of platform, for the possibility of one of these shields being struck in the front several times in the course of an attack?—Yes; I think that the shield should be of such a strength as to be able to stand repeated shots; but, as to their striking in the same place, that is a contingency which I consider so improbable, that I think you may class it with other accidents, which must be taken, of course, when they occur. I do not believe that any shield can be made which, if it were struck continually on one spot, would not in a short time give way.

202. Something has been said about the trial of plates of greater thickness than 5½ inches, and it has been stated that the results were rather anomalous, and that the plates did not follow the rule as to increase of strength in proportion to increase of thickness. Can you give the Committee any information about that?—The experiments with single unbacked plates have very generally borne out the law, that the resistance is as the square of their thicknesses; the resistance afforded by a three-plates thick shield has not done so, because the resistance is not the same; that is to say, it is not the sum of the individual resistances of the plates, nor as if the plate was of one thickness, but it has been something between the two, as would naturally be expected, if you reflect upon the circumstances. We generally find that a shot striking and forcing its way through a plate, breaks off behind a disc about twice its own diameter, and consequently the pressure brought against the back plate is distributed over an area about four times as great, and so on with the third, so that as far as the few results which can be obtained go, the result in the case of the laminated targets is short of what a single plate of good quality would show, taking it in the ratio of the square of its thickness, but it is a good deal greater than the resistance of the three plates, taken separately and unconnectedly, and that is what, I think, any one would expect.

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203. Up to what thickness have you found the resistance of single plates to hold good?—Up to 7 inches.

204. Do you believe that plates can now be made with facility at a reasonable price, considering their weight, of 7 inches thick, to bear out that rule?—Yes; the 7-inch plates have been of most excellent quality. We have also had a plate of excellent quality, 13 inches thick, but we have not had much experience of unbacked plates of more than 7 inches thickness. I am not speaking of the cost at which they are produced, but a 13-inch plate, which formed one of the shields for the granite casemate that was attacked in 1865, was of admirable quality; the accumulation of fire on a small surface was something surprising, and it resisted to the last, although it was fractured in two places.

205. Do you know how much per ton it cost?—I cannot say from recollection.

206. (*Dr. Percy.*) Will you state your opinion as to the mode in which the bolts were made, or how they ought to be made?—I am not competent to answer that question. I do not know, except from the results, and from what I have gathered in conversation with others, how they were made, and I do not profess to know how they ought to be made.

207. (*Colonel Ward.*) After the experience you have had of this shield, how many shots do you think it would take to make it no longer a defence to a gun or the gunners?—I think, perhaps, that eight shots, distributed uniformly over its surface, would have that effect.

208. The firing taking place at a distance of 400 yards?—Yes; and with a 9-inch gun. I should expect it would resist as many shots as that.

209. In practice, how long do you think it would take to put eight shots into that shield, at the distance named?—If the firing took place from a vessel, and the vessel were in motion, at not less than 500 yards distance, I believe she might fire at it for half a day, and not do it, always supposing that there is a gun behind the shield that is replying.

210. You were speaking of the less local action of the shot on the second plate, do you think that that would allow of the second plate being made of stiffer iron than the first plate—of a more steely iron?—No; because of the extension in the back plate. We have tried steel in front, steel behind, and steel in the middle, and the general result seems to be that good wrought-iron is the best.

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You require a very high extensible quality in the back plate.

211. You could not venture to put an inferior quality of iron in the back plate?—No; if any thing, I should put the best quality there. The front plate has little but a punching force to resist, the back plate has to resist a tensile force suddenly applied, which appears to me the greater trial.

(The witness withdrew).

Adjourned to Saturday next at two o'clock.

Saturday, 14th December, 1867.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Chair.*

Major-General Sir WILLIAM GORDON, K.C.B., R.E.	Lieutenant-Colonel WARD, R.E.
Colonel ADYE, C.B., R.A.	Dr. PERCY, F.R.S.
	Dr. POLE, F.R.S.

Captain HARRISON, R.A., *Secretary.*

Colonel EARDLEY-WILMOT, R.A., F.R.S., Commandant, Shoeburyness, examined.

Col. Eardley-Wilmot, R.A., F.R.S.
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212. (*Chairman.*) You are aware, I believe, of the object with which this Committee was appointed, and the questions which have been submitted to us for inquiry are these:—"1. How far the trials which have been made were unfavourable to the Gibraltar and Malta shields. 2. What were the causes which led to any failure in the shields. 3. What changes in the construction of such shields the Committee would recommend." The trials alluded to were conducted, I believe, under your supervision?—Yes; two rounds were fired at the shield.

213. Will you be good enough to state to the Committee the number of rounds fired, from what distance, the nature of the guns used, as well as the charges, and give them any other information you can in reference to the trials?—I have an entire report here of the trials, which has not yet been drawn out, because the trials are supposed only to be in progress, and it is not customary to forward reports until the trials are complete. I do not know whether the Committee would wish to have this particular report handed in, or whether I should give them a statement from it.

214. It would be, perhaps, convenient if you would state generally the nature of the trials which have taken place, and give any further information you can?—An experiment was made on the 25th of October, to test what was called the Gibraltar iron shield; it was fired at at a range of 70 yards, from a 9-inch rifled gun, weighing 12 tons. The weight of the shot was 248 lbs.—a chilled iron shot, known by the name of the Palliser shot, having a head of one diameter; the length of the shot was 17 inches, and its diameter 8·92. The charge of powder weighed 37 lbs., which was a reduced charge.

215. (*Colonel Ward.*) Can you state what kind of powder it was?—The brand upon it was "large grained W.A. rifle powder."

216. (*Chairman.*) What was the cause of the reduction in the charge?—It was in order to reduce the velocity to a striking velocity at 400 yards. The first shot struck 3 feet 6 inches from the right, and 1 foot 9 inches from the bottom. The shot penetrated 10·92 inches, base 7 inches out; most of the body dropped out in front. In the bottom plate, three bolts above the hole, two on the level, and one below, gone; they broke close to the head. In the upper plate, three bolts broke above the hole on the right edge, the bottom plate is forced away from the 2-inch plate, $3\frac{1}{4}$ inches at top, and half an inch at bottom. In the rear the shot had struck fair between two of the horizontal girders, the bottom one of which it broke through, the upper girder cracked the web of the outer flange horizontally 7 feet 9 inches, 3 inches on the inner side; the third is also cracked through the web of the outer flange. Inside skin buckled and cracked, five small plate bolts broken, seven rivets sheared, the mantlet saved the nuts from being driven to the rear. The bottom plate is buckled $1\frac{1}{4}$ inches in its whole length. The bolts broken are Nos. 28, 30, 33, 36, 37, 40, 42, 44, and 47. I will now refer to the second round. The powder and shot were of the same weight as before; struck the upper plate 3 feet from the left, $9\frac{3}{4}$ inches from the bottom. Shot penetrated $11\frac{1}{2}$ inches, and partly broke up; the plate buckled an inch and 2-10ths below the shot. The bolts broken in the lower plate on the left side were Nos. 27, 29, 31, 34, 38, 39, and 41. In the rear, skin plate is cracked through and bulged, but that requires to be illustrated by a sketch [handing in the same].

217. (*Colonel Ward.*) How many bolts were broken altogether?—Nine in the first round, and seven in the second. Left inner armour-plate is bulged back about 6 inches, the embrasure plate about 1 inch, the shot having struck on the right edge of the inner armour-plate, the left inner plate is cracked through at the right edge in the wake of the shot. The opening of the crack is $2\frac{1}{4}$ inches on the rear face; the crack extends for about $5\frac{1}{4}$ inches horizontally along the plate, and then downwards for about 7 inches, and ending about 11 inches from the right edge. The embrasure plate does not appear to be cracked at all, the top

front plate has been pushed sideways into the embrasure, and now overlaps the bottom one about 1 inch, the horizontal crack in the web of the girder opened out considerably on the left of the embrasure, the lower armour-plate is separated from the inner one about an inch and a quarter, and the upper 1 inch. On the left side the upper inner armour-plate is buckled forward 1 inch at top and half an inch at bottom; the outer armour-plate is 5-8ths of an inch at the top from the inner one outwards, and half an inch at the bottom. That is the whole of the report which has been made upon the experiments; it merely states the exact facts which took place, and the measurements on the target itself.

218. (*Chairman.*) Will you be good enough to explain to the Committee how it is that what is called in the Report of the Ordnance Select Committee "right," is called "left" in your report, and *vice versâ*?—The first round was fired on what is called in my statement the left side of the target, it being on the left side of the embrasure as you look at it. We are supposed to be the attacking party. That shot is numbered 1,469. The second shot is on the right side of the embrasure, and is numbered 1,470.

219. You have had very great experience in firing at various kinds of shields and targets for coast defences. Will you be good enough to state whether you consider the trials which have been made on the Gibraltar shield were unfavourable to it or otherwise?—I think that the shield was not of such a character, considering the quantity of iron in it, as it might have been; but, at the same time, I do not think that you can disconnect the effect upon this particular shield from the cause of it.

220. Looking at the shield itself, not with reference to the object for which it was intended, but simply as a shield, do you consider that the shield stood well under the trial to which it was subjected?—No, I do not. Sixteen bolts were driven off.

221. Do you attribute that fact to faults in the manufacture of the plates, to faults in the manufacture of the bolts, or to faults in the construction of the shield composed of such a weight of iron?—My opinion is that the absolute effect upon the shield was due, in some considerable measure, to the giving way of the bolts, first of all, and, secondly, I think it was owing to faulty construction.

222. Do you consider that the plates, taken as plates of a certain thickness, were of a reasonably good manufacture?—They appeared to be so.

223. Do you consider that the bolts were of reasonably good manufacture, or do you attribute the failure to badness of manufacture?—No; it was owing, I think, to the system of inserting them.

224. It has been stated to the Committee that the shield was set up too tightly, have you any belief of that kind?—The first two plates did not bed fairly upon each other, and that, of course, would give a very great latitude to any movement which might take place on being struck, and add a considerable amount of leverage on any particular bolt. Then, I think, that the bolts ought not to be inserted in the holes as they were inserted; the holes of the bolts were cylindrical, and only slightly larger than the bolts; and if the bolts were to be examined, you would find that when the shield was struck, and a consequent movement of the plate took place, that the front of the bolt had been nipped and almost sheared by the action of the edge of the hole against it.

225. The bolts were not conical-headed, were they?—Yes; they were conical-headed.

226. They were not counter-sunk, so as to meet the conical head?—Yes; but fitted too tightly, and the edges too sharp.

227. Do you consider the shield to have been of faulty construction?—According to my belief it was of faulty construction. My own particular opinion is that the whole system has gone in a wrong direction altogether.

228. When the gun was placed in position, what result did you anticipate from the firing?—I anticipated a greater effect upon the shield than was produced.

229. Do you consider that the gun that was used was of a heavier character than might be expected to be used against fortifications?—Certainly not.

230. Do you consider that the reduction in the charge, as stated by you in your evidence, gives a fair representation of the blow that would be given if the gun was fired at the distance represented with an ordinary charge of powder?—To the best of my judgment it does decidedly.

231. You stated, I think, that you did not anticipate that this shield was capable of resisting the 9-inch gun to which it was opposed?—It is very difficult to state that after the event has taken place, but I did not think that the plates would have stood so well as they did.

232. Do you think that in land defences it is desirable to have the protection of guns of a character not more than equal to the guns which are likely to be opposed to them?—I think it should be more than equal to the guns: that is to say that the shields should be able to offer greater resistance than that merely equal to any gun that might be brought to bear against them, because they might be opposed to such a large number and a shield, to be of real value, should not show any sign of injury on the inside.

233. Supposing that the distribution of the iron had not been, in your judgment, faulty, do you think that there was a sufficient mass of iron in the shield to perform the duty required of it?—I hardly think there was.

234. (*Colonel Adye.*) You stated that you thought the unfavourable results arrived at, so far as they have gone, in the trials made against this shield, arose chiefly from the bolts giving way?—Yes.

235. Do you consider that the giving way of those bolts arose chiefly from the rigidity of the construction?—I think it did.

236. Do you consider that if those bolts had been very slightly modified with some kind of elastic backing, a wooden one, for instance, they might have stood better?—I think they would.

237. Do you consider that there would be any objection to using wood partially for the backing of the shields for land defences?—No; I think not.

238. Do you think there would be any difficulty in making a target, the backing of which, at the end of a certain number of years, might be replaced, if it perished?—It could not be done without considerable expense and trouble.

239. Do you consider that the shield in question had other faults of construction besides the rigidity of the bolts?—That, of course, goes into the question of the construction altogether. I think that two plates bolted together in that way

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[pointing to the section] is objectionable in point of construction. If you bolt the shield too firmly, and the bolts do not give way, you penetrate the iron with comparative facility; but if you do not do that you break the bolts. My view is that no shield, if possible, should have any bolts at all in it; or if there are any, they should be very much larger and fewer in number.

240. (*Colonel Ward.*) You have not stated, have you, in your record of the experiments, what was the velocity of the shot at the moment of impact?—No; but it was 1276 feet per second in the case of No. 1469, and 1275 feet in that of No. 1470.

241. You have stated generally that you consider the shield of faulty construction, but I do not think you have stated how you would improve it?—I think that the direction in which all shields should be made should be to have the mass of iron which is to receive the blow as large as possible and as thick as possible, and to get rid of bolts entirely, if it is practicable.

242. Would you have all the iron, both in front and behind, soft and tough?—I would have the hard iron in front, and, if possible, a harder surface. I would have one large mass of iron in front, as the work is almost all done upon the front plate; and if it possesses sufficient power of resistance to absorb most of the work, the question would become much more simple than it is now.

243. Would you think it advisable to have chilled iron in front, backed with soft and tough iron?—Not of great thickness, because, if you came to great thicknesses, you would then lose the use of the embrasure, as you could not work the gun.

244. Do you think that no thickness of iron that is in use in practice would be available?—Not of chilled cast-iron, as far as we yet know.

245. Or of chilled iron?—No; for the backing it might be very useful.

246. You have stated that the plates were not bedded close together; did that arise from their not being plane surfaces?—I understood that when they were erected in the factory where they were made, they did so; but when we got them down to Shoeburyness, whether an alteration had taken place from their having been knocked about in the carriage, or any change in the temperature had taken place, we could not get the two surfaces together, and there was nearly one-tenth of an inch of space between two of the plates.

247. From that, I presume you would infer that the surfaces were somewhat curved?—No doubt they were.

248. (*Dr. Percy.*) When you spoke of a large mass of iron, did you mean a large mass in a single plate?—Yes.

249. (*Colonel Ward.*) Have you ever seen any structure wholly composed of iron, rigidly bolted together, that would stand a heavy shot?—We have had an experimental target.

250. Have they stood a heavy shot?—No; if they are rigidly bolted together, the iron, although of very fine quality, has broken short off like cast-iron, and the fracture presents all the appearance of inferior iron; and you would think it was so, unless you knew that it had been struck by a shot with great velocity.

251. Have any compound targets been tried at Shoeburyness, with chilled iron behind and wrought-iron in front?—None; but we have fired at blocks of chilled iron without any wrought-iron in front lately.

252. Do you think that they might resist shot well, if they were so made?—Yes; at all events I think it would be worth a trial, the only objection being that when you get to masses of that size you diminish the working space for the gun.

253. To have the wrought-iron to take the first impact and check the velocity of the shot, and then have the chilled iron behind to resist any further effect?—We have had no experiments in these small sizes.

254. Such targets have never been tried?—No.

255. (*Colonel Adye.*) Speaking generally, what limit would you give to the thickness of an iron shield, so as to enable the gun to be worked behind it?—If it could be made, I should like to see 10 inches for the outer plate.

256. What, in your opinion, should be the maximum?—I do not think you can well have it too thick, if you could get it made.

257. With what thickness could the gun be worked behind it?—18 or 20 inches.

258. That would not interfere with the working of the gun?—No.

259. You would propose a 10-inch plate?—Yes; but when I say that, I do not mean to say that exactly, because I would go to more if I could get it.

260. Can you give the Committee any information as to the thickest plates with which you are now acquainted, of good quality?—We have fired at 8-inch plates, and the quality of those plates was very good indeed, but they were backed with wood.

261. (*Colonel Ward.*) When chilled shot strike wrought-iron obliquely, do the shot break up?—Always.

262. Do they break up when they hit directly, and penetrate?—They break up then too.

263. But they penetrate without losing the form of the head?—In both cases they do that; on striking an oblique plate, the point of the head is very rarely destroyed.

264. Is the breaking up more general when the shot strikes the plate obliquely than with a direct shot?—It depends upon the amount of work done. If the shot penetrates, a great part of it remains solid; but if it is unable to penetrate, all that remains outside the target is broken to pieces.

265. When chilled shot have gone through, has the form of the heads become altered in passing through?—Not at all.

(The witness withdrew.)

Vice-Admiral R. SPENCER ROBINSON, Controller of the Navy, examined.

Vice Adm. R. S. Robinson.

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266. (*Chairman.*) This Committee has been appointed to make inquiry with respect to certain iron shields intended for land defences, some of which have been sent to Gibraltar and Malta; and the points which we are directed to inquire into are these:—"1. How far the trials which have been made were unfavourable to the shield. 2. What were the causes which led to any failure in the shield. And 3. What changes in the construction of such shields they would recommend." In the course of the examination, certain points have been alluded to upon which the Committee

believe you will be able to give them some information; for although you are not cognizant of the trials which have taken place, you have had considerable experience in firing at targets representing sections of ships, and which targets are in the nature of shields. First, with regard to the thickness of iron in the construction of shields to be opposed to the heaviest guns which are now or are likely to be used by ships of war in attacking land defences, what do you consider is the heaviest gun which ships of war are likely to use?—The heaviest gun that I think is thoroughly trustworthy and approved is the 12½-ton muzzle-loading rifled gun, or, in other words, the 9-inch gun. The prospect of our getting heavier guns is certainly not very encouraging; but there is a prospect, no doubt, that we shall go up to guns of 23 or 24 tons. I do not think that at present I can say I could rely upon any guns, as having been thoroughly and satisfactorily tested for the naval service, heavier than the 12½-ton gun.

267. As a naval officer, you are aware what the defences of Gibraltar and Malta are; and can you state to the Committee within what distance it is likely, in the event of iron-clad ships attacking those fortifications, they would be likely to approach the sea defences of those harbours?—At Gibraltar there are very few places where large ships can approach within 800 yards, but at Malta you might say that they could come within 100 yards of any part of the sea face.

268. Looking at the necessity at Malta for protecting the guns from the attack of ships, say, armed with 12½-ton guns, at 100 yards range, what thickness of iron shield would you consider sufficient to give the ordinary protection which men and guns ought to receive?—I think from 10 to 12 inches are the very least quantity of iron in one thickness of plate. I have doubted whether 12 inches would be absolutely sufficient upon any substance that had not some power of compressibility and yielding.

269. Do you mean one solid plate?—Yes; to make a shield that should be absolutely impenetrable to shot coming from 9-inch guns at 200 yards distance. At a less range than that I should say that 10 inches of iron, with a backing of wood, would be indispensable. I am talking now of using projectiles the most likely to penetrate plates, and to do mischief of the nature done by Palliser's sharp-pointed projectile.

270. Looking at the perishable character of wooden backing, do you think that a wooden backing is essential to the support of such plates as you would recommend for these shields for land defences?—I think that a wooden backing is extremely undesirable in every sense, but I am afraid it is indispensable. My own experience tends to show that an iron plate of almost any thickness, unbacked with wood, will be destroyed the more thoroughly rigid you make it: for instance, if you could make a positively perfect contact between a thick plate of iron and a mass of granite, you would ruin the granite rapidly, however thick the plate was. However, in saying this, you must recollect that I am no engineer, and that I can only act upon what I see. I have formed my judgment entirely on what I have seen, and looking at the facility with which thick iron plates have been broken when unbacked, and to the perfect protection of much thinner plates backed with wood, as compared with one solid iron plate without such backing, I have come to the conclusion that wooden backing, although undesirable anywhere, is yet indispensable for the effectual protection of an embrasure or a gun, or a ship from projectiles.

271. You say that it is undesirable, I suppose, in allusion to the perishable character of the material?—Yes; first, with reference to its perishable character; next, to the facility with which it can be burned, and if not burned, to the extensive ravages that a shell passing through and bursting in the backing will inflict upon a wooden backing.

272. You have spoken of plates 10 or 12 inches in thickness to be used in the construction of shields, do you believe that plates of such dimensions and of good quality can be produced in the trade?—Perfectly so, and with great facility.

273. What is the greatest thickness of plate which, at the present moment, you are using in the construction of iron ships?—We are using 10-inch armour-plates, and 9-inch armour-plates in large quantities. The weight of a 9-inch armour-plate, 14 feet long and 4 feet deep, and 9 inches thick, is about 9 tons, and at the present moment we are able to get them at a cost of 33*l.* a ton, and for plates of 6 and 7 inches cheaper than that.

274. There is in point of fact no difficulty in obtaining plates of that character if they are required?—If they are necessary, you can obtain them in any quantities you like from more than one maker.

275. Do you believe that there is no other backing but wood which at all could perform the same duty that wood does in supporting iron plates?—As a matter of belief, I say Yes; but I think it is possible some one may invent some backing that would answer all the purposes of wood. I only speak from such observation as I have been able to make, and I think that we have as yet seen nothing that has answered so well as wood. The case of the "Hercules" was a remarkable one. We put a 9-inch plate on certainly a good quantity of wood, and it was penetrated by a Palliser shot from a very large gun, a 23 ton gun; but the wood backing saved the structure from being in the slightest degree damaged.

276. (*Colonel Adye.*) You have stated that you think large ships could not approach Gibraltar nearer than from 800 to 1,200 yards?—Yes; about that distance.

277. Do you not think it would be possible for a turret ship of light draught to approach nearer than that?—Certainly, if you diminish the draught of water.

278. I mean a turret-ship armed with a heavy gun?—Yes; a turret-ship built for that purpose could approach very much closer.

279. With reference to the backing, have you ever considered the question of backing, as proposed by Chalmers, and also as developed in the "Bellerophon," by the use of end-on iron stringers?—Yes; all the iron ships in the Navy are now constructed, and they have been constructed from the date of the "Warrior," with that feature in them, more or less developed. I ought to except the "Minotaur's" class. There is no iron ship which has been constructed since the date of the "Warrior" in which the backing has not been supported by those edged plates—strips of iron horizontally interposed between the backing; but you were asking me about Chalmers' targets?

280. Yes?—The arrangement adopted is something of the same principle. It amounts to a very valuable stiffener to the frame of the ship, and more useful, in my opinion, to the ship than absolutely to the support of the armour-plate, but it

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affords great support to it, as well as giving very considerable rigidity to the frame and plating of the ship where it can be used.

281. Do not you think that, in a construction of that kind, the iron end-on of the backing gives the main support to the front plate, and not the wood?—No; that is to say, if you were to put in any number of those edged strips of iron as close together as possible, you would not support the armour-plate very much better than now, and you would ruin the inner skin or plating of the ship. You would distribute the blow upon the inner plating of the ship, and thereby do much more mischief than if you put in this compressible substance, wood, which I extremely dislike, although I admit that it has that one good effect, that is, it saves the skin of the ship.

282. Supposing we disregard the ship for the present, and turn our attention to land defences. Do you not consider that the first backing might be end-on stringers, without wood; and would not such a backing support the front plate materially?—That is really an hypothesis upon which you can form an opinion as well as I can; but if you were to ask me to construct a plate to defend any given thing, whether it were a man or a gun, or whether it was stone or wood, I should do as we do now—that is to say, I should put a certain portion of wood—to form a cushion between the outside iron thick plate and the object I wished to protect.

283. (*Colonel Ward.*) You stated that no large ship could approach Gibraltar within 1,200 yards?—I mean, of course, a large ship like the "Gloire," the "Invincible," or the "Magenta;" they draw 26 feet of water; but you might put a gun on a raft that should not draw 9 inches.

284. (*Dr. Percy.*) Have you had sufficient actual experience to justify the conclusion that a single mass of iron in one plate 12 inches thick would afford greater resistance than the same thickness of iron arranged in three separate plates?—Undoubtedly. I have been of opinion for a very long time, and I am indebted, perhaps, for it to the labours of your Chairman, which showed, I think, conclusively, that the resistance increased geometrically, or as the square of the thickness of the plate. I have had a great many opportunities of speaking to Italian and French officers on this subject, and I have found that proposition accepted by them all.

285. (*Chairman.*) You think that that rough law is to be relied upon?—Yes; and the Chief Constructor of the French Navy admits it as a demonstrated fact. I may mention that all the 8-inch and 9-inch armour-plates that we have tried from certain makers have always turned out excellent; they are of first-rate quality, and whereas when we were trying originally with $4\frac{1}{2}$, $5\frac{1}{2}$, and 6-inch plates, we had very large rejections; there is only one firm now that has failed to give us any quantity of 8-inch plates in perfect condition. The 9-inch plates are equally good. The 10-inch plates we shall test in a few days, and if the Committee should be still sitting, I will communicate the result to it.*

286. To what do you attribute the fact that plates of the size you have mentioned are of more average good quality than plates of a thinner kind?—I attribute it to the experience gained by the manufacturers. It is an old story, but we began with 13 or 14 different firms, who said that they could make armour-plates of $4\frac{1}{2}$ inches thick, but they dropped down gradually to four or five firms, and there are only four now who can really make good plates.

287. Is it not the case that the Admiralty, in buying plates for the public service, do not make contracts by open competition, but the manufacturers are taken from a selected list?—Yes.

288. Can you state to the Committee the names of the firms on that list?—Messrs. Brown and Company are the first, Messrs. Cammell and Company are the second, both of these firms being at Sheffield; the Millwall Company is the third, and the fourth is a Liverpool firm, called the Mersey Steel and Iron Company.

289. (*Dr. Percy.*) What would be the difference in the cost per ton between plates of 5 inches thick and plates of 10 inches thick?—The charge to us per ton is 30*l.* in the one case, and 36*l.* in the other. I might, perhaps, state the tests to which these iron plates have been subjected. The practice at Portsmouth has been this:—An old 68-pounder gun is brought down within 30 feet of the armour-plate, loaded with 13 lbs. of powder, and a certain number of shot, varying according to the thickness of the plate, are fired at it; for 9- or 10-inch plates 13 shots would be fired, overlapping each other; the rule is, that every shot shall overlap. The gun is fired at any selected part of the plate, and according to the cracks and damage done to the back, the plate is called A 1, A 2, or A 3: ordinary cast-iron shot are used.

290. (*Colonel Ward.*) How many classes of plates are there?—We put them in three classes. A 1 is the best of all; A 2 is an excellent plate; A 3 is a plate that may be accepted; but when we come to B 1 or B 2, they are rejected. In addition to the tests to which we subject the armour-plates, I may say that we go a great deal by what is done at Shoeburyness.

The result of a very attentive study which I have given to the penetration of armour-plates by projectiles may roughly be stated as follows:—

If I wanted to put up the smallest armour-plate that would resist a 5-inch, 6-inch, 7-inch, 9-inch, or 13-inch rifled gun, I should in each case require a plate somewhat thicker than the diameter of the projectile; or, again, if I had to destroy a defence consisting of $4\frac{1}{2}$-inch, 6-inch, or 9-inch plates, I should ask for guns whose calibre would be in excess of the thickness of the plate. Not that I attach any magic to the diameter of the shot slightly exceeding the thickness of the plate to be penetrated, but that close study of the effects produced seems to point to this law.

I presume that the *vis viva* given to the projectiles of the diameters I have named, is that which, on the whole, is the most advantageous use the gun that discharges them can be put to, and it is to the combination of the weight of the projectile, its form, and its velocity on impact, that the effects are due, provided the material of the projectile is such as to enable it to resist change of form sufficiently long.

I also wish it to be understood that my remarks apply to plates well backed and supported.

* See Appendix xiv., p. 128.

(The witness withdrew).

Captain HENRY JAMES ALDERSON, R.A., examined.

291. (*Chairman*). Three points have been referred to this Committee for inquiry with reference to certain iron shields for land defences, some of which have been sent to Gibraltar and Malta, and the points are these—"1. How far the trials which have been made are unfavourable to the shield. 2. What were the causes which led to any failure in the shield. And 3. What changes in the construction of such shields they would recommend." You have had long experience of targets, shields, and iron defences of various kinds, as well as considerable experience in firing at them. Will you, therefore, state whether you consider the trial that was made was unfavourable to the shield, which was a sample of those sent to Gibraltar and Malta?—I do.

292. You are of course aware of the construction of the shield?—Yes.

293. Will you be good enough to describe the nature of the trial to which it was subjected?—Two 9-inch chilled shot were fired at it, with 37 lb. charges, at a distance of 70 yards.

294. Before the shot was fired, what, from your past experience of shields, did you anticipate would be the effect of the shot?—I thought that the shield did not look strong enough to be opposed to the battery that was erected against it.

295. In using the words "not strong enough," do you mean that it was faulty in construction, or not sufficiently massive?—I believed the iron in it might have been differently disposed with advantage; and, further, that it did not look massive enough to resist the guns that were brought against it.

296. What thickness of iron would you desire to see used for the protection of land defences, which were likely to be assailed by guns of that character?—I think further experiments are required on that head. I should be very sorry to say, from the little I have seen in that line, what I think would suffice as a lasting defence, or what would be sufficient to stand as a permanent work. Our experiments have not yet told us that.

297. Are you of opinion that the application of the bolts to the shield was faulty, and that they were screwed up too tight, as has been stated?—I think myself that the bolts failed principally from the jar and the nipping action of the two plates.

298. You mean the shearing, do you not?—Yes. I think it has been certainly partially overcome by using better bolts, and a better mode of bolting them through the rear plate. Still, I think the difficulty will always remain so long as you use different thicknesses of plates. I believe that with the front plate considerably under the mark of the strength required for the heavy shot it is required to meet, there will always be a tendency to shear the bolts; and if you bolt up too tight (if the bolts are strong enough to hold the target together), the plates will go.

299. Supposing that the mass of iron was sufficient, do you think that a 10½-inch plate would offer more resistance than the two plates of 5 and 5½-inches in this shield?—I think our experiments show that iron disposed on the "plank upon plank" system resists very nearly as well as a solid plate. For my own part I would prefer, if I had to build up a target of plates, that the front plate should be as thick as I could get it, consistently with its being a good one. I think that the front plate should take upon it most of the work to be done, and I should prefer as thick a plate as I could get, provided it was a good plate.

300. What is the greatest thickness in a good plate that you have seen fired at, at Shoeburyness?—Nine inches in a large plate. We have had also good smaller pieces of thicker plate, such as the solid shield in the casemate, both the 8-inch plates we have now on an 8-inch target, and the plates on the "Hercules," which were 8 and 9-inch plates, were very good.

301. You do not apprehend, I presume, that there will be much difficulty in obtaining plates of 9 inches in thickness, as they are required?—I cannot see why there should be.

302. Would you prefer a 9-inch plate for this shield with the other three inches of iron otherwise distributed, so as to make up 12 inches of iron, and so put together?—I would.

303. Can you give the Committee any information as to the necessity or otherwise for backing iron armour-plates, and what character of backing you would consider most desirable for land defences, judging from the trials you have seen made at Shoeburyness?—The whole difficulty, that I can see, with regard to the backing, comes in the bolts. If you have a rigid backing, the bolts break from the jar, and you require to have a certain elastic medium to prevent the bolts from flying.

304. What substance have you found best in the form of a backing which has saved the life of the bolts the longest?—Wood is as good as anything.

305. (*Colonel Adye.*) Did the bolts give way from the weakness of the bolts themselves, or from the extreme rigidity of the target?—Partly from the rigidity of the target (the elastic washers used being next to useless), partly from the nip and the shearing.

306. (*Colonel Ward.*) I do not quite understand the difference between the two?—As I look upon it, the "shearing" is the nipping action prolonged, the bolts are first nipped by the movement of the plates, and if the rear plate be very much buckled, the "nip" becomes a shear.

307. (*Colonel Adye.*) Do you think that a 9-, 10-, or a 12-inch plate would be sufficient without any backing?—No.

308. You must have a backing?—Certainly.

309. Would not the tendency to shear be overcome by separating the two plates by a backing?—What sort of backing?

310. An end-on backing, with wood between, like Chalmers' target?—I think it would.

311. Are there any other defects in the construction of the Gibraltar shield which occur to you to mention?—I think that as it is at present, the two weak points are on each side of the port-hole; you have strength above and strength below, but the weak points are on each side of the port-hole, and a shot passing or breaking its way through there, would do great mischief to the gunners working the gun. In the centre of each of these places [pointing to the section], you have a weak point, owing to the intersection of the junction of the plates, a very weak point indeed, and the shot that struck on the left of the embrasure here [pointing to the section], struck very nearly on that junction; it struck a few inches to the left. The H girders, too, afford no support to each other.

312. You consider that that point of the shield which ought to be the strongest is the weakest?—Yes; it should be as strong as you can get it at the sides, but I think over here [pointing to the

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section] it does not so much signify. The lower part you might strengthen by a glacis in front in many cases.

313. (*Colonel Ward.*) You stated that you thought the iron might be disposed in a better way in the target: how would you suggest that it should be disposed?—Speaking of the same weight of iron?

314. Yes; and referring to the shield which has been tried?—It was 12 inches, and I would have as my front plate an 8- or a 9-inch plate, and then back it up with horizontal stringers, and fill in with wood and a skin plate.

315. You would have two plates instead of three?—Yes; and a backing, as I have described.

316. Were the plates set up close together, or was there an interval between them?—They were not set up quite close together. The plates were somewhat buckled on the right side of the port. The target had been put together at the place where it was made, and then it fitted perfectly true, but after that it had been taken to pieces and sent down to Shoeburyness, and when it was put up there it did not quite fit.

317. Do you think that that at all materially affected the experiments?—No; I could not say that, because I think that the other elements of weakness operated more than that.

318. It has been suggested that the bolt-holes should be rounded at the edges, in order to prevent shearing: has that been at all tried?—Partially, by rounding the rear edges of the holes in the front plate.

319. Was the effect of that good?—Yes; it saved the bolts a good deal. The holes in the rear plate were increased in size and filled in with wood round the bolts.

320. (*Colonel Adye.*) Do not you think that the result of the recent experiment, as far as it has gone, shows that it is objectionable to bolt two plates of iron closely together, so as to make them touch, and, therefore, if you have two plates in a target, that they should not be in contact?—They would be better, certainly, not to be in contact, as you would get rid of the effect of the shear.

321. (*Chairman.*) You would have a cushion between the plates, and not an air space?—Yes; I would fill it with a backing of wood.

322. (*Dr. Percy.*) In all your experience at Shoeburyness, have you ever seen any structure composed wholly of iron, and rigidly bolted together, stand in a satisfactory manner?—I cannot say that I have; and it must be remembered that none of the early targets were ever fired at with the shot that they are now.

(The witness withdrew.)

Adjourned till Monday next, at two o'clock.

Monday, 16th December, 1867.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Chair.*

Major-General Sir WILLIAM GORDON, K.C.B., R.E.
Colonel ADYE, C.B., R.A.
Lieutenant-Colonel WARD, R.E.
Dr. PERCY, F.R.S.

Captain HARRISON, R.A., *Secretary.*

Mr. JOHN HUGHES, Manager of the Millwall Ironworks, examined.

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323. (*Chairman.*) This Committee has been appointed to ascertain how far the trials which have been made were unfavourable to a shield representing the Gibraltar and Malta shields; what were the causes which led to any failure in that shield; and what changes in the construction of such shields they would recommend. The Committee are aware that you have turned your attention to the construction of shields for land defences, and they wish to ask you whether the War Office is not now in possession of a shield constructed by you for that purpose?—Yes. When I received your letter I understood that the inquiry was to be with reference to foreign fortifications, and that that was why you particularly asked me to come, therefore I am only prepared for that.

324. Will you be good enough to state what evidence you will be able to give us to-day upon the subject of our inquiry?—I can give you some evidence to-day with regard to some forts that I have made for service abroad, and the papers connected with them. Upon any future day I shall be able to give you evidence on this very shield, because I have examined it on behalf of Colonel Jervois, and I have reported upon it to him.

325. What is the nature of the construction of the shield which you have made, and which is about to be fired at by the War Office?—If you will be kind enough to postpone that matter till another day, I will then bring a model of it; but I have some drawings here [producing the same].

326. If you will be so good as to bring a model of it before the Committee, it shall be returned to you; and perhaps you will be good enough to explain by the drawings the nature of the shield about to be fired at?—This [pointing to the same] is a drawing of the shield, and this is a strut [pointing to it] as usual, as it is in the Malta and Gibraltar shields; but I have a model outside of a Russian fort, and if that is brought in it will, I think, assist a little in explaining this. [The model was brought in.] As I said before, this [pointing to the same] is the usual supporting strut; but instead of having with it a large bar in front as you see it there [pointing to the same], the one to be shot at is made with two $\frac{3}{4}$-inch plate, equal to $1\frac{1}{2}$ inches; and on there, instead of a solid plate, we have a hollow rail or stringer, similar to those which are used on the Great Western Railway, but of much larger section. These are then filled with teak, both the inside and the rear, and between the two, under the face of that,

[describing] there is a 9-inch plate on the lower half of the shield, and on the upper half there is a 6-inch plate; but half of that 6-inch plate is covered with a 3-inch plate on the laminated principle, like that of the Americans. I may say, therefore, that there will be three experiments got out of one shield. Then, at the back, there are three vertical rails, similar to this which is in front, and then the bolts pass between each rail through the wood; and so that does away, in my opinion, with the shearing action upon the bolt when the plate is struck, giving you a rigid backing as far as the penetration of the shot goes, as well as an elastic backing to save the bolts from the impact of the shot. As far as my memory serves me, I believe that the weight of this shield is 28 tons.*

327. Do you know how that compares with the other (the Malta shield)?—Yes; I believe that that is 32 tons.

328. (*Dr. Percy.*) The area being the same (12′ × 8′)?—Yes.

329. (*Chairman.*) Why do you propose to use a 9-inch plate for the lower half of the shield, and a 6-inch plate and a 3-inch plate in the upper part of it?—That was with a view to satisfy certain experiments which Colonel Jervois wanted to be made, but not that I should recommend it, but it was done solely on the score of economy.

330. What would you recommend?—Supposing you wished to fortify a place, I should recommend that the shields should be classed into A, B, C, and D, or 1, 2, 3, and 4. These shields [pointing to the drawing] being nearest to the sea, and being more exposed to the attack of iron-clad ships, ought to have stringers of 10 inches and a plate of 10 inches; that would be for a first-class shield, as I will call it.

331. I gather from your answer that you would prefer a solid plate to two plates constituting the same thickness?—Most decidedly.

332. Do you think that there would be any difficulty in constructing plates of the thickness you have mentioned, and of good quality?—None whatever.

333. And at a reasonable cost?—Yes.

334. (*Dr. Percy.*) What should you think would be a reasonable cost?—Of course it would be a commercial transaction, but I consider that the cost would be from 30*l.* for 5-inch plates to 35*l.* for 10-inch plates.

335. (*Chairman.*) Will you inform the Committee what is the greatest area of plate that can be rolled?—As our mill stands now, we could roll a plate 7 feet 6 inches wide.

336. Is there any reason why such a plate should not be rolled, if there was a demand for it?—None at all.

337. Would it add much to the expense?—It would add a little, because, of course, the risk would be greater, if we happened to get a bad plate.

338. Suppose that there was a sufficient demand, and it was desired to obtain plates of considerable weight, so as to cover an entire area with a solid plate, what is the greatest width of plate that you, as a manufacturer, could undertake to produce?—I may tell you that the Millwall rolls now are 8 feet long; but the beds of the foundations are arranged so as to take 10-feet rolls, because I have always thought that it would come to that.

339. (*Dr. Percy.*) Do you mean a plate 10 feet wide?—No; 9 feet 6 inches wide, as we require an allowance for planing, and say about 20 feet long.

340. (*Chairman.*) Would that add very materially to the cost?—It would add a little to the cost of production.

341. How much per ton would it add to the cost?—Just speaking off hand, I should say they could be made for about 40*l.* a ton.

342. So that a 10-inch plate, 9 feet 6 inches wide, and of 20 feet length, could be produced for about 40*l.* a ton?—Yes.

343. (*Dr. Percy.*) I suppose the price would depend upon the demand, or to a considerable extent?—Yes; it would materially.

344. (*Chairman.*) Have you completed your description of the shield?—Yes; as far as I can at this moment, without my models and drawings.

345. (*Colonel Adye.*) Your principle, as I understand it, is to have a thick iron plate in the front?—Yes.

346. Then a backing of horizontal stringers, like rails upon a railway?—Yes; but of much heavier section.

347. With wood inside the stringers?—Yes.

348. And wood between each of the stringers?—Yes.

349. Of what depth should you propose the first backing to be?—I began by explaining that I would have classes for the shields; and supposing that the best was a first-class shield, that would have a 10-inch plate and a 10-inch stringer. Then a second-class shield would have a 9-inch plate and a 9-inch stringer. The next would be a third-class shield, with an 8-inch plate and an 8-inch stringer; and the fourth class, a 7-inch plate and a 7-inch stringer. I should wish the plates and the stringers to be of equal thicknesses, for reasons which I will explain.

350. That first line of stringers [pointing to the drawing] is horizontally laid?—Yes.

351. Then, as I understand your plan, you propose to have a second line of stringers in the same way, but placed vertically?—Yes, vertically.

352. (*Dr. Percy.*) Do you mean vertical stringers behind the horizontal ones?—Yes; but the two ¾-inch plates are placed between. These [pointing to the drawing] run horizontally; then they are riveted with the view of forming a construction on the two plates, and then these [pointing to the same] come as vertical beams crossing the others.

353. (*Colonel Adye.*) Do you propose that they shall be between the first and second backing of the plate?—Yes.

354. Of what thickness should they be?—The first-class, I think, should be about two inches and three-quarters between the two, but I have had drawings of all these classes of shields made, which I showed to Sir John Burgoyne some weeks ago, at Millwall.

355. The front armour-plate has a horizontal stringer, and then the thin plate has a vertical stringer?—Yes; now I come back again. This shield [pointing to a drawing] was made some two years ago; and now, having these large guns to deal with, the object was to make it equal to the shield that I see standing there (the Gibraltar shield), and we are allowed to put in six girders, three box girders in the rear of the shield, top and bottom, whereas in the Gibraltar shield there are seven girders; this will have six, one girder less. There is another unforeseen circumstance that occurs to this; it is not carried out exactly on my principle, because we have a 7-inch girder stringer

* By *calculation* the weight of this shield is 36 tons 10 cwt. —A. H.

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against a 9-inch plate; it is not according to the theory that we intended, but to accomplish it it would have required several pairs of rolls, and become expensive; and Colonel Jervois considered it sufficient to test the merit of the hollow stringer as a backing.

356. Your principle, I think, is, that there shall be different classes of shields, according to the situation in which a gun is to be placed?—Yes; but the other is a material point, and my attention has been called to it.

357. Your second principle is that the stringer shall have the same depth as the plate?—Yes.

358. Do not you think it would be an improvement if those stringers were solid, instead of having wood in the middle of them?—No; because you would then add a larger amount to the weight without giving any extra strength, and lose the advantage of the elasticity of the stringer, which I consider of great value to the shield.

359. Do not you entertain some fear of their buckling from being made thin?—No, I do not; I am not now speaking off-hand, or without having narrowly watched the experiments which have already taken place on other targets.

360. Then supposing that you were to keep the wood between each set of stringers, you do not think that there would be any advantage in making what is now the wooden part in the centre of the stringers of solid iron?—No; and for this reason, that a shearing action would take place, and that has happened to the Gibraltar shield, the effect of which was to cut all the bolts away.

361. The shearing action in that case appeared to have taken place from the junction of the two iron plates, and the lateral motion which was caused; but in this case you would not have the two iron plates in contact?—If you make this [pointing to the drawing] solid, it will be equivalent to two iron plates, and then you come back to a rigid backing.

362. I mean that part [pointing to the drawing] to be solid, and not this part [pointing to the same] in the centre of your stringers. If that were solid, would not that arrangement add very much to the strength?—None whatever, and for this reason: This rail [pointing to the same] would then be much more expensive, taking it in a commercial point of view, looking at the way in which the iron is formed in this [pointing to the drawing]; it is rolled in such a way that the fibre goes round with the flanges of the stringers, and under the impact of a shot, my belief is, that a hollow rail, filled with wood, would stand and be stronger than a solid one, judging now from the experiments which I have already seen conducted at Shoeburyness on materials for other structures.

363. Do you not think that your proposed construction would be much more complicated than if you had the stringers of solid iron?—No; if you gave me the job to-morrow, and asked me what I should make them of, whether they would be solid or hollow, I would say that I would as soon make the one as the other at the same price per ton weight; but as the solid one would be much heavier, the cost of the shield would be increased without receiving additional strength.

364. Supposing that the shields were made up as you propose, and that in the course of years there was reason to fear that the wood had perished in the middle, would it not be difficult to replace that perished wood?—No doubt of it.

365. If, on the other hand, you were to have the stringers of solid iron, would they not be mode easy to repair?—Quite so; but then, in one proposition that I made for these shields, they were to be filled with a composition made of Trinidad pitch. I am referring to that which was proposer for this Government not many days ago; it is indestructible, as far as weather is concerned. Instead of using wood, there are two modes of doing it.

366. (*Dr. Percy.*) Is not Trinidad pitch very inflammable?—Yes, it is; and that is one of its drawbacks.

367. (*Colonel Adye.*) What is the width of the top of the stringer [pointing to the drawing]?—I believe that that is 4 inches, which would be for the fourth-class shield.

368. Would not that 4-inch stringer, 10 inches deep, be a very cheap thing instead of that [pointing to the drawing]?—I will explain that; but first with regard to the teak: if a shell got in, the teak would be liable to take fire, but there would be nothing to burn, therefore, the danger would be nothing, being as it is surrounded with iron; but still it is an argument against it. However, I turned my attention to the subject of teak, and I made many inquiries of persons well able to give me information as to the duration of it in connection with iron. I have had it from very good authority, from Green's people on the River Thames, and from Mr. Lungley, and from shipbuilders in Liverpool, and it appears that teak ships, 60 or 70 years old, which have been broken up in London and in Liverpool, are as good as the first day they went to sea. Also, with regard to the iron bolts which have been in those ships during that number of years; when a bolt has been struck out, it has been found to be perfect. Judging from that evidence, there is no fear of the teak lasting at least 100 years, in the position it occupies.

369. A piece of wood put in the centre of these stringers [pointing to the drawing] must be a very small piece?—Yes.

370. How many inches?—Two inches and a-half by five and a-half in this very one [pointing to the drawing].

371. Do you mean the wood, or the whole stringer?—This stringer [pointing to the same] is 7 inches high by 4 inches wide outside.

372. What width is it?—Four inches across the top; then here [pointing to the drawing] it is about 2½ inches in the centre.

373. (*Dr. Percy.*) What kind of bolts should you adopt?—The same bolts as are shown in this very drawing of shield. Referring to the shield that is to be shot at; one half of it is filled with teak on one side, and the other half of it with bitumen, so that the experiments to be tried will test the two materials. With regard to the bolts, these bolts [pointing to the same] are 3½ inches, while those in the other shield (the "Gibraltar") are 3 inches.

374. Are they bolts of the Palliser kind?—No; they are the plain Admiralty bolt, with a Baskcomb washer.

375. Was the process technically termed "upsetting" resorted to in those bolts?—Yes. My attention has been called to it for many years, and after it was first called to it, I watched all the bolts that were fired at, Palliser's and others. I have made many, and of those tried at Shoeburyness, whether they were my make or anyone else's, I have never seen a bolt giving way in shields through being upset for the purpose of manufacture—not one.

376. Then, according to your experience, they are not likely to be injured from being manufactured in that way?—No, I think not.

377. When made without the process of "upsetting," such bolts would not be better than bolts manufactured the other way?—No; but as good for the work they have to perform.

378. (*Chairman.*) Will you be good enough to state to the Committee, with reference to the four kinds of shields that you propose, what thickness of bolt you would be inclined to adapt to each thickness, according to the size of the shield?—The bolts that I would propose to use for a 10-inch plate would be 4 inches in diameter. The next to that would be for a 9-inch plate, $3\frac{3}{4}$ inches; for an 8-inch plate, $3\frac{1}{2}$ inches; and for a 7-inch plate, $3\frac{1}{4}$ inches.

379. (*Colonel Adye.*) Would you bolt right through all?—Yes; right through everything.

380. Then, with a 4-inch bolt, you would bolt through the wood that lies between the stringers?—Yes.

381. What is the width of the wood between the stringers for the last shield?—As far as I can remember, this is $5\frac{1}{4}$, the one I have here before me.

382. Do you mean $5\frac{1}{4}$ inches of wood between?—Yes.

383. If a 4-inch bolt goes through, it would leave a very small piece of wood, would it not, between it and the iron stringer?—Yes; for the larger bolts there will be larger stringers and a larger flange altogether.

384. Then it comes to this, that your stringers are further apart in the stronger shield, and nearer together in the weaker one?—Yes.

385. Do not you think that there is an objection to that?—The experience that I have had on armour-plates is, that if you strike an armour-plate of $4\frac{1}{2}$ inches, you will find that the rear of that armour-plate is extended in a much greater proportion than in the thicker one, and that the plate bulges out in the rear considerably more. Therefore, we calculate our stringers both as to the depth of each stringer, and the width between, with the thickness of the armour-plate it has to carry, as well as the thickness of the inner plates that carry the stringers.

386. Yes; but the weaker plate will, of course, bulge more than the stronger plate, and the stronger plate is intended by you to withstand a much stronger gun?—Quite so.

387. Then if you make the front plate very strong, and increase the size of the bolts accordingly, you will have to separate your supporting stringers more for the large plate than for the small one?—Yes; but the stringer is 10 inches deep, and has two $1\frac{3}{8}$-inch plates (equal to $2\frac{3}{4}$ inches), so that it is met in another way. Then as to the bolts, there has been a great deal said, and I think justly, with regard to making armour-clad forts for the present day, and what would be required for future fortifications, to withstand future guns. I think that matters can be so arranged that, supposing I take, for example, Plymouth Fort, I think it would be possible to do this—that another coating of plates could be put on it without interfering with the structure in any way whatever.

388. (*Colonel Ward.*) Do you mean externally to the 5-inch plates?—Yes.

389. (*Colonel Adye.*) Would you not then get into this further difficulty, that you would have the shearing process repeated by having two iron plates in contact?—No doubt of it, as the Gibraltar shield is constructed; but we have at present a system of bolts as you have now of plates, plate upon plate; and I may mention that I do these things for the Russians very differently from what the Royal Engineers are doing for the British fortifications. I fasten the structure with a hollow bolt, a specimen of which I have to show the Committee [producing the same], and the effect is that the front plate may be shot away, but the structure remains intact, it does not break in the bolts. I have made 4-inch bolts for the Russian Government, and if we were to put in a 3-, or a 4-, or a 5-inch plate at any time, by adopting the hollow bolt, if that plate [pointing to the drawing] were shot away, and was destroyed, these plates [pointing to the same] could then be renewed without interfering with the structure. If your plate were injured here [pointing to the drawing], and you took it down to put in a new one, then you would open the whole thing, which you dare not do in prospect of war, as it would take considerable time to effect, while the plan I have arranged for Russia can be carried out at a few days' notice.

390. Will you explain to the Committee the nature of the hollow bolt?—This [pointing to the model] is the kind of bolt which we have made for the Russians; this is a hollow bolt, only it happens to be a double-coned one; but supposing that I made a shield similar to that which I see there, I would make the bolts hollow, and those bolts would be rolled with the fibre running right round them; they would be put in as a cone in the usual way, and screwed tight together, and then if you wanted to put a plate on plate structure upon it at a future time, this bolt goes in [describing], and screws up. Therefore, if this plate [pointing to the same] is shot away and destroyed, the structure is still intact, and so you are not very badly off.

391. (*Colonel Ward.*) What is the broadest plate that can be rolled at the present time?—A plate 6 feet wide is the largest.

392. If you were called upon to make a plate of 9 feet 6 inches, how long would you be before you got the machinery ready to make it?—I should think about a fortnight, to get the rolling mill ready.

393. Do you think you could get the rolls ready in a fortnight?—No; I should have to shift my standards, which would take a fortnight, and new rolls would take about four weeks more.

394. I am alluding to the 10-feet rolls?—To get those rolls ready, and do everything, I dare say it would take six weeks.

395. Would you accept a contract to do some work in a month's time?—No; but I would in six weeks.

396. Is there not much more waste in rolling large plates than in rolling smaller ones?—The waste is just the same in proportion to the size of plate.

397. In rolling any plate, is there not a great deal of waste at each end?—It is the same. You have only two edges and two ends.

398. When you roll one large plate, the waste would be like that [describing], would it not—a round piece at each end?—No. I will explain it to you. In making moulds for armour-plates, they are all made perfectly sharp and square, and thus they go square into the furnace.

399. If you were to roll planking of not more than $16\frac{1}{2}$ inches wide, what would be the cost per ton for it?—Our calculation for the works of the fort I have spoken of is 18*l.* a ton.

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400. (*Chairman.*) You are the contractors?—Yes.

401. (*Colonel Ward.*) If you were to make two plates 4 feet wide, what would be the price per ton?—28*l.* to 30*l.*

402. And you have stated, I think, that a plate of 9 feet 6 inches would cost 40*l.* a ton?—Yes.

403. What would be the price of cast-iron or chilled iron for backing such a wrought-iron plate?—That would depend upon the shape and form of it.

404. Say 7 inches thick, of cast-iron or chilled iron, at the back of a 6- or 7-inch wrought-iron plate?—Chilled cast-iron is very much more expensive than other iron; as for that now being made at Woolwich, pig-iron of the highest quality is being used.

405. But not so expensive as the other iron you have spoken of?—You have to mould it the same, and if we made a block, say 6 feet long or 8 feet long, for this shield, it would be 4 feet wide, and of course it would be of cold blast iron.

406. (*Dr. Percy.*) Not necessarily so?—No, not necessarily so. Of course the price would depend entirely upon what it was made from. I should say about 10*l.* a ton, delivered.

407. (*Colonel Ward.*) It would be 6 or 7 inches thick?—Yes. I am referring to that: and at the present moment the idea at Woolwich is, that nothing but Pontypool iron will do.

408. Have you ever considered whether it would answer to build a shield with chilled cast-iron behind a wrought-iron plate?—No; I have never thought of that, and I cannot say, therefore, whether it would answer or not, although my attention has been called to it lately. I have no doubt you are aware that iron plates have been fired at with unchilled cast-iron backing some years ago at Shoeburyness, and I made the plates.

409. I believe they were then only 3 inches thick?—Yes, I think so.

410. I am assuming the front plate to be 7 or 8 inches thick, and the back plate of cast-iron or chilled iron 5 or 6 inches thick: have you had any experience of such a construction?—The only experience that I have had has led me to think that it would not stand at all. If you have cast-iron, you must have a thicker bulk of it than that—6 inches.

411. What experience do you refer to; have there been any experiments made in that direction at Shoeburyness?—There was a cast-iron block there, and, as far as I can recollect, I think it was something like 18 inches thick.

412. But the front plate was only 2½ inches thick?—Yes, I believe so.

413. I am supposing the front plate to be 6 or 7 inches thick of wrought-iron of the best quality, and a back plate of about the same thickness, composed of cast or chilled iron?—That would be a very good thickness for the front plate, but I would make the other of double the thickness in cast-iron.

414. Do you think it would be better than the compound backing which has been used very often?—Really I am not able to answer that question, as so many plans have been tried.

415. (*Chairman.*) I believe you have been employed by various foreign Governments to make shields to protect guns; are you prepared to give the Committee any information upon that subject?—Yes.

416. You have been employed, amongst others, by the Russian Government?—Yes? I have also designed some works for Turkey, photographs of which I will send you; they are bomb-proof shields to be fixed in earthworks. I have shown models of these to Sir John Burgoyne and Colonel Jervois. I am also making models for another Government now, which you can have before you at any time you think proper: these have also been shown to the War Office authorities.

417. Were you employed upon the defences at Antwerp?—I was consulted upon the Antwerp fortifications, and I went there in 1862.

418. Can you give us any information to-day as to the shields you have constructed, or as to which you have been consulted, either by the Russian Government, or any other?—Yes; I can as to the Russian Government.

419. Do you consider that the shields which you have made for the Russian Government are better than the shield you propose to have tried at Shoeburyness?—I believe that the Russian shields are stronger.

420. Are they much more costly?—Yes; they are also more costly.

421. Is it, then, merely on the ground of expense that you propose cheaper shields?—Entirely on that ground.

422. Where expense is not a consideration, or where the position is so exposed that it would be impolitic to consider expense, you would prefer the description of shield you have made for the Russian Government to the one you are putting forward at this moment for the use of the British Government?—Yes.

423. Can you state to the Committee the difference in cost per shield as between the Russian shield and the one you have mentioned to us, and which is about to be tried?—Yes. The Russian shield would cost about double the money. One is worth 2,000*l.* per shield, and the other 1,100*l.* The model that I am to show you now is to assist me in illustrating the plan of the shield that was made for the Russian Government, and this was made at Newport, in Monmouthshire, in 1861. This strut [pointing to the same], as shown here, has gone by another name than of those who invented it, which I complain of, and as such it is printed in the War Office Records, and it has gone abroad. I made this and the model. This is a shield forming part of a fort.

424. How many shields of that nature have been put up for Russia?—One, or rather three, mounting three guns of the heaviest calibre, but I have a small plan here showing the harbour of Cronstadt, which will explain its situation better than by verbal description.

425. Is there only one 3-gun shield of that kind *in situ*?—Yes; and that is in the centre of the channel. This shield is put close to the side of the water, but then it is all solid granite underneath it. Beyond that, to the right [pointing to the plan], there is a fortification which was constructed in Russia, made of girders framed up and backed with wood, faced with 6-inch armour-plates, and I think that is a 6-gun fort.

426. Will you give us what information you can as to the shield?—This is the Russian shield [pointing to the model]. I took the contract, in connection with Mr. Lancaster, and it was made at the Millwall Iron Works, and delivered in 1864. These are the bars [pointing to the same], 12 inches by 12, and these [pointing to the same], but including the dovetail, are 15 inches thick. These are sections made for Antwerp, for covering masonry, and they are 10 by 10, but with no

dovetail at the back; it was considered by Colonel —— that no larger guns than 68-pounders could be brought to bear against them, and these are fastened in this way, instead of a through-bolt, this bolt goes in so [describing]. That bolt [pointing to the same] in the Russian shield, takes out as far as the strutt is concerned, and then the Russians always have a bed- or base-plate that unites and brings everything that they have edge-on to the face of the shot of the enemy, and a similar plate at the top, in every shield; they always have those plates. Then there is another part of this shield that I think is worthy of your notice.

427. (*Colonel Ward.*) First tell me what gives rigidity to this part [pointing to the model]?—The grasp principally of that; but we have a double dovetail bolt in as well as keys for tightening up the work, as far as the strut is concerned. These bolts here [pointing to the same] are totally left out in the British fortification, both in the top and bottom plate. This shield has a port-stiffener, which is also left out in the British forts. We have an idea that the enemy will always try to dismount the gun, and therefore have taken care to strengthen that part more than any other. This bolt is put up in this way [describing], and as to bolts, they have to contend with two difficulties: upon the laminated principle, or plate upon plate, a shearing action takes place, and that destroys them; and in targets made of wood, such as the Admiralty use, and the Russians also, the action which assists in breaking the bolts, I think, is the back action, when the blow is so severe on the face that it strikes and goes back, and that is the action, I think, which causes the bolts to break off at the threads. I think the best proof of that is this, having watched it very narrowly, that you find the mark of the washer in the plate when it is brought back. To meet this difficulty, in the Russian shields we adopted these bolts; they do not come through, and thereby weaken the bar, but the bolt fits into a dove-tail in the rear, and the end of the bolt does not come within a quarter of an inch of the bar itself. Here [pointing to the model] there is a space between the two, and when a shot strikes it, the rebound upon it slackens it, then it comes back, and the bolt holds to its work. These port-stiffeners then go in, and not only do they bolt through the top and bottom plates, but they tenon into a slot in the same plate also. This is the model of the one we made in 1864, and we have now designed a very large one for them (that is, last year), which is to be put in another part of Cronstadt; it is to be erected here [pointing to the plan]. This [pointing to the plan] was a very weak position during the Crimean War, and now it is one of the strongest that the Russians have; they also propose to erect a very large fort here [pointing to the plan].

428. (*Chairman.*) Will that be exposed to the near fire of ships?—Yes; the first attack will be made there [pointing to the plan]. Colonel —— was over here for some weeks arranging this plan with us, and this was the last one that we designed this year for them. This [producing the same] is a full-sized drawing showing a section of that fort. It is equal to 27 inches of solid iron, and this is a 12-inch bar of the same section as used in the one erected [pointing to the same]; also 12 inches thick in the rear, both being made of wrought-iron. These [pointing to the same] are two laminated plates, 1½ inches each, to be made by the Russians themselves; they were afraid that they could not well bend 3-inch plates to come over; we were to make all these in readiness for them, but the facings to be laid on were to be lighter plates. The difference between their laminated system and the British is this, that they put all the strength into the back of the shield, and the lighter plate in front, so that if that is destroyed, it can be replaced, but they still maintain, by having this strength in the rear, they obtain what they call a back-bone to the structure, so that it can not be destroyed.

429. You are speaking of this plate as a manufacturer, but do you approve of the system that the Russians are adopting, or would you prefer to have a larger and thicker plate in fronf?—I would avoid lamination in every possible way. I am only describing what the Russians have adopted, and I have not been giving an opinion at all.

430. (*Colonel Adye.*) I see that the bars are on the tongue and groove principle?—Yes. Then there is another thing which the Russians pay a good deal of attention to, and, I think, with some advantage. You will observe here that in the facing of the work they have an idea that all the bars should be on their edges comparatively, but that in the back of the structure the fibres should be reversed, so as to get them up and down. I mean vertically. Then in these back bars of 12 inches thick the fibre runs up and down, and when a shot strikes the front bar [pointing to the same], it is much harder, in order to resist the shot from penetrating; but when a bending takes place, this [pointing to the drawing] bends like a piece of hoop iron, but does not break, on account of the way it is manufactured. Then there is another thing which I wish to point out, which is, that they never fail to bring everything up to the structure end-and-edge-on, and thus throw all the weight which they possibly can on the front wall, so that there is not a particle of iron used but what supports itself, and at the same time gives support to its neighbour; and all the eminent engineers of England, in constructing the beautiful bridges and fine roofs that we see in connection with railways, have carefully studied this; but I am sorry to say that the same attention has not been paid in designing British fortifications. I speak with a little feeling upon this matter, but I think it is my duty to explain all that I know to you as a Committee, with a view to the defence of my own country, and I will do so fearlessly. You will observe that this is a fort [pointing to a drawing] as it is in its present position; there is a plate here, and there are girders. This strut [pointing to the same] is put up edge-on to the plate, and fastened to it, so that when a blow is struck, this [pointing to the drawing] receives it, and this strut is keyed and bolted together, as I have described; the whole of the girders, instead of standing out from the work, are brought up to it, so that the whole weight of the material is brought forward to give all the support it can to the front. My object is, if possible, to destroy the shot before it destroys the shield, and, therefore, to make it strong enough to break the shot.

431. (*Colonel Ward.*) Has that kind of shield ever been fired at?—No; it has not yet been made. I should explain that the Russians get models made on a very large scale, and fire at them before they commence upon the actual work. I made them a set some time ago, and they were a ton each.

432. Are these horizontal bars [pointing to the same] held together by the dovetails entirely?

Mr. J. Hughes. 3 Dec. 1867.

—No; they rely also upon the back bars and the dovetail bolts [pointing to the same] it is open from one end of the fort to the other.

433. This is an iron plate, is it not?—No; it is an iron bar 2 feet wide.

434. But this is 12 inches thick, is it not?—Yes; but these are bars, not plates [pointing to the same]; and instead of bars on their edges, as you saw in the fort before, in this fort these bars are now made 2 feet wide, and are continuous all along from one end to the other of the fort.

435. What is to prevent its being knocked over so [describing]?—The bars behind, and the top plates and struts.

436. That is, here and there?—No; the bars are right along, and the struts every 14 feet 6 inches.

437. Are they vertical bars?—Yes.

438. (*Colonel Adye.*) Are they not solid plates?—No; they are bars; the fibre in the large bar is horizontal, so as to meet the enemy's shot on its edge, and these are then dealt with as bars, with the fibre up and down.

439. Is it of that height and this length [pointing to the drawing]?—Yes, all along; and they touch each other.

440. (*Chairman.*) There is a series of continuous bars, as I understand you?—Yes.

441. (*Colonel Adye.*) If I understand you correctly, the most recent Russian shield is made with a series of horizontal bars 12 inches by 15, tongued and grooved, with the fibre presented edge-on?—Yes.

442. These front bars are each dovetailed to a solid bar behind, and 2 feet wide, and 12 inches thick, with the fibre running perpendicularly?—Yes.

443. Making up a total of 24 inches of iron?—Yes.

444. In front of the whole the Russians intend to have a thin plate of 2 or 3 inches?—Two separate plates, of $1\frac{1}{2}$ inches thick, the whole thickness being equal to 27 inches.

445. Are you of opinion that that is a good form of construction?—Yes, I am.

446. Is it the best form?—It is a good one. I do not say that it is the best.

447. Do you think it is a good application of the iron?—I believe that it is good.

448. (*Chairman.*) Do you approve of putting thin plates in front?—No; I would put a thicker plate in front.

449. (*Colonel Adye.*) Do you not apprehend that a very heavy shot striking that thin plate might not only knock it away, but cause a disruption of the whole shield?—No.

450. Can you tell the Committee the cost of that shield per ton?—I have given the first at about 2,000*l.* a-gun.

451. I am alluding to the most modern one?—That would be 27 inches, and I am not prepared to answer the question, because it is not yet made.

452. (*Chairman.*) Will it cost more than 2,000*l.*?—Yes; because there will be more iron in it.

453. (*Colonel Adye.*) Such a shield has not yet been fired at?—No. Models of this have been fired at, weighing a ton each; that is the way in which the Russians test all theirs before they commence their work.

454. From your experience, do you consider it would be necessary to expend as much as 2,000*l.* to cover one gun against the heaviest gun that could be brought to bear against it?—If you will tell me the calibre of the gun and the range, I will give you my opinion.

455. Would it be necessary to expend 2,000*l.* on such a work to defend one gun against a 9-inch English gun fired at 100 yards?—No; you can stop an English gun at less than 2,000*l.* a-gun.

456. Is there any foreign gun which is more powerful than the 9-inch English gun?—That I do not know.

457. (*Dr. Percy.*) I think you say that in the case of these horizontal long bars [pointing to the same] the fibre is end-on?—No; edge-on; the girders are end-on.

458. That is to say, the fibre is parallel to the axis of the bar?—Yes.

459. Is it possible to make a structure of that sort with the plates firmly welded together, and corrugated too?—Yes, quite so.

460. Is it possible to make a structure of that sort with a series of parallel stringers?—Yes.

461. (*Chairman.*) Would it not be very costly?—Not very costly. There is another, a stone fort, which the Russians are going to protect, of which the Committee, probably, would like to hear something. This [producing the same] is a plan that they sent to me, and this is how they are going to cover a great many of their guns.

462. (*Major-General Gordon.*) Have the goodness to explain the plan which you have now produced?—The forts at the present time are made of granite; and the Russian officers, from experiments which they have had conducted time after time, find that they are valueless against modern artillery; but to reconstruct all the buildings which they have at Sweabourg, Cronstadt, and elsewhere, would put them to immense expense; and they say that in case a war were to break out, they might be caught in the act of reconstruction, and so they will not run the risk of that. They have therefore proposed a plan, and this which I now produce was sent to me, showing something like what they wanted to construct, viz., an embrasure of iron, and instead of using shields as we do, they propose to cover the whole face with plates equal to 12 feet square, of 6-inch iron, backed with my "hollow stringer"; and, judging from experiments which they have tried themselves, and also from experiments which I have witnessed at Shoeburyness, that a glancing shot would be rather a disagreeable visitor amongst gunners; to prevent that they have formed the cheek of the embrasure corrugated on both sides. This [pointing to the plan] is about 8 inches thick in the hollow of corrugation, and there [pointing to the plan] it is about 12 inches in thickness in the prominent part, these being on the cheek or side of embrazure. They have adopted this form to prevent glancing in of shots. So as not to injure the fort when struck, they have adopted in the one we made for Cronstadt on this plan the hollow stringer, covering the whole of the work, and riveted to an inch and a half plate, to lessen the effect of the blow upon the granite; for their experiments have shown that when they have covered the granite with a plate only, and it has been struck by their heavy guns, the plate does not break in front, but the stone breaks and crumbles to powder behind; and with the view of meeting this grave difficulty, they have proposed to use hollow stringers in all their future works for the protection of stone. Then, lastly, comes a 6 or 8-inch plate, bolted through masonry work; and all the guns that are facing the sea, and open to attack by iron-clads, are to be covered in this way [describing].

463. (*Colonel Adye.*) That will be an adaptation of iron to the old fortifications?—Yes.

464. They would not make new ones?—Not for a moment, because I may mention that they are at present, as it were, abandoning their old fortifications, and they are making new ones in advance of their old position, miles out to sea.

465. (*Chairman.*) What would be the cost of that plan of protection to each embrasure?—Really I forget what they paid me for it, but they gave me a large price, being the first having had to make a great many drawings and models for them before they decided upon the precise plan. It is a very expensive mode of doing it, and I think a cheaper one might be adopted.

466. (*Colonel Adye.*) Do you think that the corrugation in the embrasure would save a shot from glancing in?—Yes; I believe so; it would be a matter between the shot and the cheek of the embrasure which should go first. At Shoeburyness, when I saw dummies stuck up inside a casemate, with an embrasure something like the one in question, but without the corrugation, the shot went in and knocked down six out of nine. I think this experiment was tried in 1860. I shall have great pleasure in forwarding to the Committee tracings of all the drawings I have been describing

(The witness withdrew.)

Captain WILLIAM HENRY NOBLE, R.A., examined.

467. (*Chairman.*) You hold the position of an Associate Member of the Ordnance Select Committee?—Yes.

468. You have had an opportunity of witnessing the trials made upon a shield similar to those sent to Gibraltar and Malta?—I have.

469. Will you state to the Committee how far the trials which have been made were, in your opinion, unfavourable to that shield?—In the first place, the fastenings did not hold; that was the principal defect. As far as the resistance of the structure goes, I think that thick plates bolted together are nearly, but not quite, equal to a solid plate of the same thickness—that is, always provided that the fastenings hold.

470. Provided that it be found advantageous to adopt the system of construction of iron forts, known as the plank upon plank system, or plate upon plate system, do you consider that the resistance of a structure thus built up, of comparatively thick plates, is equal to that of a solid plate of the same total thickness?—No; I do not consider that the resistance of the compound structure is absolutely equal to that of the solid. I think, however, that it is nearly so, provided the compound structure consists of but two or three thicknesses of, comparatively speaking, thick plates. I speak now of the absolute resistance to perforation, and I assume that the fastenings hold well. An experiment of this nature was tried at Shoeburyness last summer, and it was made upon two targets that were supplied by Messrs. Cammell, of Sheffield. No. 1 consisted of two $3\frac{1}{2}$-inch plates riveted together, making a total thickness of 7 inches, the plate being 5 feet by 4 feet. No. 2 consisted of three $2\frac{1}{3}$-inch plates riveted together, making a total thickness of 7 inches, the plate being 5 feet by 4 feet. The iron of which these plates were composed was identical with that used in No. 7 solid plate previously fired at. Both targets were firmly secured to wooden supports, but unbacked; and they were fired at with Palliser shot from the 7-inch rifled muzzle-loading gun of 7 tons, the range being 70 yards. The following conclusions may be drawn from the results, taken in conjunction with those at the 7-inch solid plate. First, with the above gun and projectile at this distance, it would require about 15·5 lbs. of powder to perforate a solid 7-inch plate, the energy of the shot being 61-foot tons per inch of its circumference; secondly, it requires about 14 lbs. of powder to perforate a 7-inch compound plate, made up of two separate thicknesses of $3\frac{1}{2}$ inches riveted together, the energy in the shot being about 57-foot tons per inch of its circumference; thirdly, it requires about 13 lbs. of powder to perforate a 7-inch compound plate, made up of three separate thicknesses of $2\frac{1}{3}$-inch, the energy in the shot being about 52-foot tons per inch of its circumference. These results show that plates thus built up in thick layers, bolted together, afford a very large amount of resistance to perforation, although they are not quite equal to a solid plate. It is probable that the resistance of three 5-inch plates, riveted together, would equal that of a solid 13-inch plate, while, as far as we know at present, they would be decidedly cheaper. I may mention that these were not exactly Ordnance Select Committee experiments, but they were experiments of which I had official cognizance. I was one of the executive officers.

471. You do not, then, consider that thick plates bolted together can be called a laminated structure in the general acceptation of that word?—Certainly not; the very word "laminated" denotes a number of thin plates or scales.

472. Do you draw any distinction, or can you indicate what the distinction is between what you consider a laminated structure, and one that is built up of thick plates?—It is difficult to say, in the absence of direct experiments; but I think that a laminated structure, in the usual acceptation of the term, is what the Americans used in many of their monitors, and what the Iron Plate Committee experimented upon in the Hawkshaw Targets, but I do not consider that the word "laminated" applies to a compound structure composed of two or three thicknesses of comparatively *thick* plates.

473. Do you consider that the resistance of wrought-iron plates varies as the square of their thickness?—I do, within certain limits, which depend upon excellence of manufacture, and provided the shot acts something like a punch, that is, provided the shot is blunt-headed, and punches a piece of plate out in front of it, I do not think that the resistance varies throughout as the square when the shot are pointed, and of a material such as chilled iron. I think, however, that up to a thickness of $5\frac{1}{2}$ inches the resistance is as the square, no matter what the shape of the projectile is. We have had very few experiments at very thick unbacked plates, and without actual experiment it is impossible to state accurately what will be the effect of heavy projectiles impinging on iron structures.

474. Assuming that the resistance is as the square of the thickness, do you consider that the total resistance of a compound structure, consisting, say, of three 5-inch plates, will be equal to the sum of the resistances of its parts as compared

Capt. W. H. Noble, R.A.

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with that of a solid plate of 15 inches?—Most certainly not. All the plates of the compound structure in rear of the front one act as backing, and although the resistance of plates taken individually may be as the square of their thickness, it by no means follows that the resistance of a compound structure is equal to the sum of the resistances of its parts taken separately. In the instance quoted the sum of the squares of the three thicknesses would be 75 against 225 for the 15-inch solid, and following this reasoning, we might expect a compound structure of 25 1-inch plates to be only equal in resistance to one 5-inch solid plate. I need not say that actual experiment has proved that this cannot be true. I would refer, also, to my answer to question No. 470.

475. In the above case what solid thickness would, in your opinion, be equal in resisting powers to three 5-inch plates bolted together?—There are really so few experiments which bear on this point that it is most difficult to form any opinion on the relative resistances of solid and compound structures. In the absence of direct experiment I hesitate to answer. I think, however, that it would take a 13-inch solid plate to equal the resistance to perforation afforded by three 5-inch plates, provided always that the bolts or rivets hold.

476. Assuming that a compound structure is advantageous, have you formed any opinion of what should be the thickness of the outside plate?—I think that the outside plate should be of sufficient thickness to take most of the work out of any shot that may hit it; but with the present guns I do not consider that it should be of less thickness than 8 inches. If you use thinner plates, they are liable to buckle, tear, and shift their position, and to bring great strain on the fastenings.

477. Do you consider that it would be advantageous to use a backing of wood or other elastic material in iron fortifications?—That entirely depends upon whether the elastic material will prove perishable or not. I consider that an elastic material such as wood, placed between the outside armour-plate and inside skin, is indispensable in armour-plated ships, and would be of the greatest possible assistance to any structure, no matter whether for land or for sea. The first action of a shot on striking a plate is to pulverize the portion of iron in its immediate front, and this it does from its high velocity. The next action depends upon the form and material of the shot. With ordinary cast-iron shot much of the work is expended in fracturing the projectile, with wrought-iron shot in altering the form or flattening the projectile, and with hardened shot, such as steel or chilled iron, very little work is expended on the projectile, and the effect on the plate depends upon the form of the shot's head. If this be blunt, the projectile separates a certain portion of the plate in its immediate front, and pushes the piece thus struck out before it. If the head be pointed, the projectile wedges itself into the plate, separating, to a certain extent, the laminæ of which the plate is composed, and these laminæ are cut out and curled back, while the shot slips through with very little plate in front of it. Now, if you have a perfectly rigid structure, the blow on the outside plate will be quickly communicated to all those in rear of it. Or in the case of a thick single plate the blow will probably crack it right through, although it may not have been sufficient actually to strike the piece out. If, however, another shot strikes near the same place, the piece will probably be driven right out. This would not be the case if there were a backing, because the backing would hold the pieces separated, in the first instance, and, by its elasticity, would prevent the blow being communicated so directly through the whole structure, as it is in the case of a rigid mass. In addition to this, backing is of immense advantage to the fastenings. Well-constructed bolts will hardly ever be broken, if they can depend upon a good elastic backing. Whereas in rigid structures very great difficulty will, I am convinced, be experienced in keeping the fastenings whole; therefore I consider that the introduction of an elastic backing between the plates used in all defensive structures is of so much importance that no pains should be spared to have it if possible. And, considering that this backing could easily be renewed or kept under cover till required, and in the event of a war put into the shields at the expense of very little time and money, I think that its use is quite feasible. The iron parts of all shields could be erected in their places and held together with a few bolts, and when the shield is likely to be attacked, the wood backing and remainder of the bolts could be put into it; but if this course be deemed objectionable, the backing could be renewed every few years.

478. You say that you do not consider that it will be an easy matter to preserve the fastenings in rigid structures. It is presumed that you mean bolts or rivets?—Yes; my remarks principally had reference to bolts or rivets, but they are also applicable to other fastenings which are liable to rust, &c. It would be possible to roll armour-plates with a kind of corrugated backs, which would fit into one another, something like those patent pen wipers; these backs could be fastened together, and so do away with bolts altogether; but it is very doubtful whether this would not render plates more expensive, so that there would be no advantage gained in point of economy by the plate upon plate system. If the structure be rigid, and the iron of the plates touching, the rivets or bolts are liable to be broken, either by shearing or nipping, which takes place when one plate moves on the surface of the other, or by snapping asunder, by the plates buckling and bringing a great strain on the bolts. If the bolt-holes be made larger than the bolts, and the latter leaded or the holes packed with wood, and rounded at the edges, it will probably do away with some of the tendency to shear, and if the nuts are furnished with good substantial elastic washers, it will probably save them somewhat; but, in my opinion, a backing of wood or some other suitable material would be the best of all safeguards.

479. Do you consider that a shot striking near another meets with much less resistance; in other words, do you consider that the resistance of a plate is much diminished in the immediate vicinity of the point on which a former projectile has struck?—It depends upon the extent and nature of the previous wound. If that wound is the result of a heavy racking blow, partaking of the nature of a bruise, the immediate parts around it are decidedly weakened, because they have had time to support the part struck, and they have received their share of the general blow. If, however, the wound partakes of the nature of a cut, or was a punching blow, I do not think that the structure is much weakened, except just round the edge of

the wound, because the effect has been local, and is confined to that immediate portion of the target struck. In using the word "punching," it must be understood that I do not mean that the action of the projectile bears any analogy to punching by statical pressure. It must be remembered that the area of damage caused by the perforation of a plate is almost twice as large at the back as it is at the front of the plate; the latter is, therefore, weakened all round the circumference of the hole made by a punching shot.

480. Have you witnessed any experiments in connection with iron fortifications? If so, be kind enough to favour the Committee with your views as to the extent of such experiments, and whether, in your opinion, they were on such a scale as to warrant the immediate adoption of any particular system?—I have witnessed almost every important experiment in connection with the attack and defence of iron structures which has taken place since 1861. In many of these experiments I have acted as one of the Executive Officers. With regard to the extent to which experiments, having special reference to the construction of land defences, were carried, it is well known that the trials of this nature were not nearly so numerous, or on such a large scale as those connected with the construction of armour-plated vessels. I may say, in fact, that this subject has not received anything like the prominence which its importance demanded. The trials of the Thorneycroft shields and the Inglis plank-upon-plank targets were carried on chiefly with guns which are now looked upon as quite obsolete, and the results of those experiments do not afford any safe criterion from which to judge of the powers of resistance of structures which will be attacked by the guns of the present day, which are in every way superior. The Inglis plank-upon-plank system was decidedly the best of those systems tried up to its date, and it afforded a large amount of protection against the missiles with which it was assailed, but those missiles are nothing to the projectiles by which such a structure is liable to be attacked now; in fact, the heaviest gun used in those trials would be of inferior power to the lightest which would be probably employed now. Still, I consider that shield would afford a fair amount of protection to casual fire even now. The only trial of importance subsequent to that of the Inglis shields was the attack on the casemated embrasures at Shoeburyness in 1865. In this case heavy guns were used with steel shot, and the shields received a considerable battering. On the whole, however, I think that before embarking in any large scheme of defence, it would have been judicious to have experimented more fully than has been done.

481. In making the statement you have now made, are you aware that the Inglis shield was fired at with what was called a 300-pounder shot and 45 lbs. of powder?—Yes; but the shot were of cast-iron.

482. You have alluded to the two shields which were fired at in 1865 at Shoeburyness—one was a 13½-inch plate, the other a structure on Mr. Chalmers' system; which of those shields do you consider afforded the greater protection?—These shields were as follows:—East shield, on Chalmers' system, area, deducting port-hole, about 81 square feet, composed of 4-inch outside plates, resting on edge plates 8 inches × 7·8 inches, which rested again on a 2-inch plate, which rested on 6 inches of teak, upon which was laid the inner skin of 1-inch plates, the whole bolted together with through bolts from front to rear, and secured to a strong iron girder frame. This shield was struck by 13 shots fired from guns of from 7-inch to 10-inch calibre, the total energy expended being about 34,313 foot tons, or about 424-foot tons per square foot of surface. The projectiles were all of steel but one. This battering broke 11 out of 37 armour-bolts, besides a considerable number of rivets, some of which were thrown to the rear with some force. The shield, however, was not disabled, and would still have afforded a good protection. The West shield was a simple 13½-inch solid plate, with a port-hole cut in its centre; area, deducting port-hole, about 28 square feet. It was struck by nine shot, one of which was cast-iron, the rest steel, the total energy being 22,400 foot tons, or about 800 foot tons per square foot of surface. From this it appears that this shield received a greater battering per square foot than the other; although cracked through at the conclusion of the practice, it was still serviceable. This shield had the following advantages over the other:—first, it had no bolts, nuts, washers, or other fastenings, which were liable to be broken, and fly; second, when once placed in its position, it can hardly go out of order, and has nothing perishable about it. It had, however, the following disadvantages, as compared with the compound shield:—first, from its reduced area, it afforded a comparatively small amount of absolute protection, and as the shields were recessed in the granite work, its port was more liable to admit splinters either of ricochetting shrapnel or pieces of the adjacent granite; second, it necessitated a mode of fastening, by which it became part of the granite work in which it was placed, and it was consequently, liable to be cut out, and eventually overturned; third, when once fairly cracked through in several places, it would speedily fall to pieces by its own weight. As the experiments were not carried out fully, it is hard to say which shield would have ultimately triumphed.

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483. Supposing that it is intended to erect iron shields of the nature of that known as the Gibraltar shield in permanent works, do you consider that the shield should bear any proportion to the rest of the work, or to the parapets, whether of stone or of earth, which may be raised between each shield?—No; I consider that the strength of the shield should be quite irrespective of the thickness of the rest of the parapet, there being only one tier of guns.

484. Alluding to question No. 481, I see that the Iron Plate Committee report that there were steel shot fired at the Inglis shield?—Yes, but not from the so-called 300-pounder. A Whitworth 7-inch steel shot was fired at it.

485. Do you think, then, that the shield should give a perfect protection *per se*?—I do; I look upon a shield in the same light as an iron strong box; although all around it should perish, it should still have, if possible, an *impenetrable* front. The shield *per se* should afford a perfect defence, as far as can be secured, to the gun and the detachment. It is principally, however, a defence for the gun.

486. Which kind of attack should, in your opinion, be directed against one of these shields—on the punching system, or on the racking system?—I think it entirely depends upon how the shields are constructed; if they are made like the present armour-plated vessels, it will be difficult to rack them, and the punching attack should be followed.

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If, however, they are rigid, I would rack, and not punch.

487. Do you consider that the shields known as the Gibraltar shields afford sufficient protection against the guns of the present day?—I consider that these shields afford a fair amount of protection against any ordinary fire which would be directed against them by a vessel which was moving past rapidly at a distance; that is, assuming that they are intended to protect guns from a casual shot. I do not consider, however, that they would stand severe battering with heavy guns for any length of time. It must be remembered that at Shoeburyness a shield is attacked point blank in the most deliberate manner, whereas on service it would have the chance of receiving quite as many glancing blows as it did direct. I take it that shields are mounted in works in order to render them almost impregnable to any ordnance which is likely to be brought against them. If a work is thus constructed, it will necessitate a special expedition on the part of the enemy, and if the enemy considers that the destruction of forts thus protected is essential to the success of his policy, I take it that he will fit out a special armament for this purpose, and conduct the attack with the most powerful guns which can possibly be obtained. Under these circumstances, and looking to the expense of any nature of shield, I consider that if supplied at all they should be of such a construction as to stand a good hammering from any guns likely to be brought against them. And from this point of view I do not consider that the shields known as Gibraltar shields are strong enough to afford complete protection against the guns of the present day.

488. How then would you propose to strengthen them?—Although I do not consider that these shields are constructed on the best principle, still I consider that, from their nature, they can be very easily strengthened as far as the addition of iron will do it. I should prefer to re-construct the shields, and introduce a backing; that may be difficult or impossible, but I think that they should have an extra 5-inch plate on the outside, or an 8-inch plate substituted for the present 5½-inch.

489. In building a new shield, what sort of general construction do you think would afford the greatest protection?—This is a subject for experiment. I can only give an opinion which is based on my own general observations. First, then, I consider that the problem to be solved may be stated as follows: Required to defend a certain area in the best possible manner, and at the least possible expense. If it is decided to adopt a rigid system, I consider that the plank upon plank, or plate upon plate system offers more advantages in the points of economy, facility of manufacture, facility of addition to or repair, than the solid system. But I object to a rigid system altogether. I think it is wrong in principle. I consider that the main principle on which iron structures for defence should be constructed is a thick armour-plate to check the blow, and next a judicious backing, to absorb what remains of the blow after it has been checked. I consider that the backing, known as Campbell's, or Chalmers', offers great advantages, particularly in resisting the racking blows of spherical or hemispherical-headed projectiles, although it is not so well calculated to resist the blows of pointed projectiles. I think, therefore, that this system of backing should be incorporated in any structure of iron defence. If money was no object, we could doubtless put up such a mass of iron, both as plates and edge planks, that it would be practically indestructible; but when this cannot be done, we should, I think, construct shields on the following general principles: (1) Outside armour-plate of at least 8 inches in thickness, resting on (2) a system of double flange stringers, or single angle-iron stringers attached to an iron plate of from one to two inches in thickness, which would rest against (3) a 5-inch iron plate, backed by horizontal 12 by 12 inch wood baulks, and a ¾-inch iron skin. (4) The spaces between the stringers to be filled, if possible, with wood, or other elastic material; but if the construction does not admit of this, the spaces should be merely cellular. If they were filled up with concrete, or any such substance, the structure would partake more or less of the rigid form, and the outside blow would be directly transmitted to the back. (5) The whole structure should be bolted together with Palliser bolts from front to rear, and be secured to a strong iron girder frame in the usual manner. (6) Wherever possible, these shields should be made semicircular, and should project somewhat from the rest of the parapet; in no case should they be recessed. (7) It is a matter for consideration whether they should be constructed so as to admit of the wood backing and bolts being inserted after the erection of the shield, or whether this backing should always form a part of the shield, and be renewed from time to time. In the former case the backing could remain in store under cover, and be added whenever it was likely that the shield would be attacked. In connection with this subject I wish to state that all iron forts should, in my opinion, be as low as possible, and should not be constructed in tiers, except where such a construction is positively unavoidable. These iron defences will, in future, be attacked by the most powerful rifled guns which can be obtained; but the attack will probably have to be made from a distance, as the immediate vicinity of such a fort would be a network of torpedoes. In the practice of rifled artillery the vertical errors greatly exceed the horizontal errors, that is to say, there is a much greater chance of missing an object by shooting under or over it than there is of going right or left. If, therefore, the object be low in vertical height, it will probably be missed a great number of times, while, if it be a great towering structure, every shot will have a good chance of hitting some part of it; and if the top part crumble away, the debris will be very likely to block up and mask the lower embrasures.

490. Have you calculated the expense of such a structure?—No, I have not.

491. Can you give any idea, or make any comparison of the cost of what you would suggest, as compared with the structure which we have before us?—No, I cannot.

492. In many of the experiments at Shoeburyness the guns have been fired with a reduced charge to represent the effect of the full charge at longer ranges. Will you give the Committee some information relative to that practice?—I think that in all cases where it is possible the full charge should be used, as the experiment will thereby be carried out under the same conditions which would occur in actual warfare. When, however, it is required to ascertain what will be the effect of a projectile fired from a long range, it becomes necessary to adopt some other means

than that of actual practice at this range, for the following reasons: first, the target is generally of small area, and the difficulty of hitting this small object at long ranges is very great. No doubt it might be struck once or twice in a number of rounds, but the chances are that it would not be struck on the exact point where we wished the blow to be delivered, and the expenditure of ammunition would be very great. Under these circumstances it is advantageous to fire the gun at a short distance with a reduced charge, which will represent the full charge at a longer distance. The amount of the blow depends upon the weight of the projectile, and the velocity with which it may be moving at the moment of impact, and once the shot has left the muzzle of the gun, the latter has no more influence over it. It is evident that if a projectile of a certain weight struck an iron shield with a velocity of 1,000 feet, a certain amount of work will be done. This work depends entirely on the weight and velocity of the projectile, and has nothing whatever to say to the distance at which the gun may have been fired from. Let us suppose now that we wished to test an iron shield, and that you provided two guns for the purpose, say, two 9-inch muzzle-loading rifled guns, of 12 tons, A and B, both of identically the same pattern, and both using the same nature of projectile. We place one of these guns, A, at 400 yards, and the other, B, at 70 yards from the shield, and we wish them to strike a blow of equal amount, in other words, to strike with the same energy. Suppose we load the gun at 400 yards with its service charge of 43 lbs., and shot of 250 lbs., giving an initial velocity of 1,340 feet. The instant this shot leaves the muzzle, it will begin to lose velocity by the resistance of the air, and when it has arrived at 70 yards from the shield, it will be moving with only 1,281 feet per second. But this is the distance at which B gun is, and as the guns are identical, it is evident that if B gun be fired with a charge which will give 1,281 feet initial velocity, the projectiles from both guns will strike the shield with the same velocity, and the work done will be identical. The problem, then, is to assign the proper charge to B gun, so as to ensure its having an initial velocity of 1,281 feet. This can be done by direct observation, and it is found that 37 lbs. is the proper charge in the case of the guns abovementioned. Now, although the absolute amount of work done will be the same in both cases, still we can not strictly say that the effect of this work will be identical, for the following reasons: first, we assume that both projectiles strike the shield at the same angle; secondly, we assume that the projectile, if elongated, which has travelled 400 yards, is as steady as the one which has only moved 70 yards. Although, however, these assumptions are not strictly legitimate, still, within ordinary limits, they are practically allowable. Thus the difference in the angle of incidence of two projectiles, one fired from 400 and the other from 70 yards, is totally inappreciable with large charges and heavy shot. This difference, indeed, would be very slight up to 1,000 yards. The variation, also, in the stability of the projectile would be very little. Under these circumstances, it is often advantageous to employ reduced charges to represent the effect of full charges at long ranges; but it is not pretended that the results are absolutely identical, and recourse is only had to this method when it would be impossible or impracticable to obtain a hit with a full charge at long distances.

493. You say that the initial velocity of the 250 lb. shot fired with 43 lbs. of powder from the 9-inch rifled muzzle-loading gun is 1,340 feet, and that the remaining velocity of the shot at 330 yards from the muzzle, or at 70 yards from the shield will be 1,281 feet. Will you inform the Committee how these figures are arrived at?—The initial velocity of all projectiles used in this country is determined experimentally by the use of either the Navez or Navez-Leurs electro-ballistic apparatus. This instrument measures a very small portion of time—viz., that taken by the projectile in passing over a small portion of the trajectory immediately in front of the muzzle. The space passed over divided by the time gives the velocity with which the projectile may be moving, but as this velocity is observed at a point a short distance in front of the muzzle, it must be corrected for loss by resistance of air. This correction, which usually amounts to but a few feet, is made by calculation, the result being the velocity at the muzzle, or initial velocity. With regard to the remaining velocity, that is sometimes observed and sometimes calculated. There are various formulæ for this purpose, all based on laws deduced from the resistance of the air. Any one of these formulæ will give a practical result, and the principal ones are (1) General Didion's, where the resistance is considered to vary as the square and the cube of the velocity, or $\rho = b\,v^2 + \beta\,v^3$; (2) General Mayevski's, where the resistance is supposed to vary as the square and the fourth power of the velocity, or $\rho = b\,v^2 + \beta\,v^4$; (3) M. Hélie's, where the resistance is supposed to vary as the cube of the velocity, or $\rho = \beta\,v^3$. None of these are absolutely correct, but from experiments which have been made in this country by means of Leurs's chronoscrope and Bashforth's chronograph, the resistance appears to be nearly as the cube of the velocity between certain limits. Some further experiments are now in progress with Mr. Bashforth's very ingenious instrument, and, pending the completion of these trials, we generally use M. Hélie's formulæ with constants determined from actual experiments with our own projectiles. The formula is very simple:

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$$v = \frac{V}{1 + c\,v\,x}$$

in which v = remaining velocity at distance x.
„ V = initial velocity,
„ $c = b\,\frac{R^2}{W}$.
„ R = radius of shot in feet.
„ W = weight of shot in lbs.
„ b = constant, depending on the form of the projectiles.

From experiments with the 9-inch muzzle-loading rifled gun and 3-inch breech-loading rifled gun it appears that the mean value of b is 0·000063 between 1,500 and 1,000 feet, and 0·000036 between 1,000 and 600 feet. We will take now the instance of the 9-inch muzzle-loading gun at 400 yards: the shot was 250 lbs. in weight, and 8·9 inches in diameter, the initial velocity was by experiment 1,340 feet, and we require to find the remaining velocity at 330 yards, or 990 feet. Here c will equal $0{\cdot}000063\,\frac{R^2}{250}$.

(1) $R = 4{\cdot}46$ inches.
$R = 0{\cdot}37166$ feet.
$R^2 = 0{\cdot}13813$ feet.
$\frac{R^2}{250} = 0{\cdot}0005525$

and $C = 0{\cdot}000063 \frac{R^3}{W} = 0{\cdot}00000003481$. The above equation will therefore become

$$v = \frac{1340}{1 + 0{\cdot}00000003481 \times 1340 \times 990}$$

$$= \frac{1340}{1{\cdot}04618}$$

$$= 1280{\cdot}8.$$

Experiment has proved that in the above gun this initial velocity will be given by a charge of about 37 lbs.

494. (*Colonel Adye.*) You have stated that plates riveted together are almost equal in strength to a solid plate, provided the bolts hold?—Yes, to resist perforation, and provided that only two or three thicknesses are used.

495. Do you not think that by the plan adopted in the Gibraltar shield, there are two very weak points on each side of the embrasure?—I am not talking of the shield, I am talking of the mere resistance to perforation of two plates. If I take two 5-inch plates and bolt them together, and fire a shot direct into the centre, and fire another shot direct into the centre of a solid 10-inch plate, I think that the two 5-inch plates will very nearly equal the resistance of the 10-inch plate, provided my bolts hold.

496. In the Gibraltar shield you are, perhaps, aware that the two front plates were horizontal and the second row vertical?—Yes.

497. Are there not two very weak points, one on each side of the embrasure?—Yes; upon that construction.

498. You have stated that the Gibraltar shield could be strengthened by adding another plate in front; but do you not think, if you were to pursue that course, it would be impossible for any bolt to hold it together?—I think it is entirely a matter for experiment.

499. Looking at the effect of the two shots which have been already fired, and the way in which the bolts gave way, do you still think it would be advisable to strengthen the shield by adding another iron plate?—I do not see any other means of doing it, without taking it all to pieces.

500. You have said that you would not recess the shields, will you state for what reason?—Because the splinters of the brickwork or granite are apt to fly into the port-hole, and not only that, but the shrapnel. We had instances of that at Shoeburyness, in the casemate; they burst on the granite and were deflected into the port. The splinters from a shell bursting on the sill of the embrasure, went right into it.

501. You have expressed your opinion that the shields should be of a semi-circular form?—Yes.

502. Do you conceive that that form would give a stronger protection?—I think that there would be less chance of its being penetrated, because every projectile would probably strike at an angle, so that it would be the same almost as firing at a turret.

503. Do you think there would be no difficulty in the construction, as to the backing of a semi-circular shield?—I can give no evidence upon that point.

504. Speaking generally, do you consider that the question of iron land defences has been worked out by a constant course of experiments in the same elaborate and complete manner as it has been done with regard to improved ordnance?—Certainly not, for land defences.

505. The matter has not been elaborately gone into?—Certainly not, but for sea defences it has.

506. (*Dr. Percy.*) Do you think that as much has been done in the way of investigation with regard to land defences as for naval defences?—Certainly not.

507. (*Colonel Ward.*) It has been suggested to the Committee by a witness, that if the thin plate had been inserted in the middle, between the two thick plates, the shield would have been stronger, is that your idea?—It is a mere idea; it might possibly be so.

508. Do you think that if the thin plate had been put in the centre, the shield would have been stronger?—I do not think it would have made much difference; it might, however, cover the joints better.

509. When were the experiments made to which you have referred?—They were carried out last summer, I think it was in July.

510. Lately?—Quite lately.

511. I suppose the iron was then as good as it is now?—Yes.

512. The experiments that you alluded to were made, I think, upon three whole plates, with no joints?—Yes.

513. Can you at all account for the difference in the law of resistance when conical-headed shot are used?—It is difficult to do so in the absence of experiments, and we have not had sufficient to enable us to work that question out. We have had very few experiments with pointed shot against unbacked plates, but a good many experiments have been made against backed plates, and there the reason is clear, because the round or flat-headed shot punches out a piece of plate, and carries it forward.

514. When a shot first leaves the gun, has it not a tendency to wabble about?—That depends upon the rifling.

515. And whether there is any windage?—Yes.

516. The windage would be likely to make the shot wabble, whatever the rifling might be?—Yes, much windage would; and there is a theory which has been advanced by Major Palliser, that these projectiles spin like a top, and that they do not get steady until they reach a certain distance. The theory was advanced to account for these projectiles not penetrating a target at 70 yards, when they do so at 200 yards.

517. If you were to back a 7-inch plate with harder iron, with soft iron in the front plate, would not that be a good backing, so that all the bolts might take the shock at the same time?—The only reason why I should put in chilled iron would be as a defence against chilled projectiles: that is to say, to break the shot; but I think it would be worth trying.

518. If the back was rigid, every bolt would feel the shock of every shot, would it not?—Yes, within certain limits.

519. And, therefore, each bolt would be individually less tried?—Yes, theoretically it would.

520. I mean with a chilled iron backing, and a 7-inch wrought-iron front plate, and if the backing was rigid, a shot upon the front plate would be felt by every bolt, would it not?—Do you mean to have the backing in separate parts?

521. No; in as large pieces as possible, of chilled iron?—That is, in blocks of chilled iron?

522. Yes?—If they were separated, it is very likely that the bolts in the next block would not feel so much.

523. If you could make all the bolts feel the

same shock, each would be less tried, and with that object, would not a rigid backing of chilled or cast iron be an advantage?—I do not think it follows, but I think a backing composed of chilled iron blocks is worth trying.

524. You know nothing against it?—No; no experiments; but I know that experiments have been made against cast-iron; that has been tried by the Iron Plate Committee, and did not succeed.

525. With a very thin plate in front of 2½ inches?—I think it was so. *Capt. W. H. Noble, R.A.* 16 Dec. 1867.

526. Nothing like 7 inches of iron in front?—No; but then the guns were small also.

527. (*Chairman.*) Have you anything further to state to the Committee?—I wish merely to add that, in alluding to the plank-upon-plank system, as tried by the late Special Committee on iron, I do not think that it is fairly represented by the present shield.

(The witness withdrew.)

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528. (*Chairman.*) It has been stated in evidence that one great cause of the failure of the Gibraltar shield was the nature of the bolts that were used as fastenings. The Committee have reason to believe that those bolts were of your design, and they would be glad to hear what you have to say as to the construction of those bolts, and generally as to the question of fastening shields by bolts in structures which require bolts to support them?—The bolts that were used in that target were reduced in the shank upon a plan which I proposed to the late Iron Plate Committee some time ago, but the heads were formed by "jumping" the iron, as it is technically termed, whereas my proposal was to draw the bolt down from a bar of iron sufficiently large to leave the head behind it. The effect of "jumping" the iron is to turn the grain or the fibre partially round in a transverse direction from its original longitudinal direction, and the bolt becomes, as it were, a bar of iron with a piece of plate welded on to the end. Five years ago, in experiments that I made, and which are published by the Iron Plate Committee, I found that dropping a weight down upon bolts when the heads were made by being "jumped," or "upset," invariably snapped off the heads [describing]. In consequence of those experiments, I was led to propose a head formed in this way [describing]. The evil was so subtle that its existence was generally disbelieved in. I therefore think that it is a most fortunate circumstance that experiments have been made with bolts whose heads were improperly made. The necessity of not injuring the longitudinal fibre has now been demonstrated. Had it not been for this experiment it would have been looked on as a nonsensical theory. An 8-inch plated target now at Shoeburyness is fastened with my bolts, it has been fired at by the 9-inch gun, the shot from which penetrated it, I think, a score of times; but until the "Rodman" gun was fired at it, there was no instance of one of these bolts being broken, and there were about 80 of my bolts in the target. Two bolts have been broken by the Rodman shot, one was pulled in two, and the reduced part, which originally measured 2·6 inches in diameter, now measures 2·5 inches, thereby showing how much the iron had been pulled out before it was torn in two by a shot which carried away the skin and everything before it. The second bolt appeared to be defective; but little strain was brought on it.

529. Do you attribute the breaking of the bolts on the occasion referred to entirely to faulty manufacture, or, as has been suggested, to the fact that they were screwed up too tightly?—Not at all to their being screwed up too tightly, because the bolts on the 8-inch plated target were screwed up as tightly as they could be screwed with long levers.

530. Then do you attribute it entirely to a faulty construction of the bolt?—To the faulty construction of the head. There is another point which I should wish to allude to, and that is the separate condition of things that comes into play when two plates are in contact with each other—namely, the tendency to shear. That was obviated before the recent experiments were made by rounding down the corners of the junction of the bolt-holes; but still, with that, a violent nip is liable to come upon the bolt, owing to the buckling of the target, and the holes crossing each other slightly; the consequence is that when the strain comes on the bolt at the same time as the nip, it will snap at the place where it is nipped, and the mode of obviating this tendency to break, would be by still further slightly reducing the shank, at a place where it cannot be nipped, till you made it sufficiently weak to stretch at the reduced part, instead of snapping in the place where it is nipped. I also think, with respect to those very thick bolts, that it would be well to reduce the shanks still more than they are reduced for another reason. In these targets when a shot strikes on one side of a bolt and bulges in the skin, it turns the bolt-head on one side, and gives a tendency to tear off in the screw thread, whereas if the shank is sufficiently weaker, then the shank will stretch, and it will not break at the nut. I do not consider that elastic washers are of the slightest use to the bolts, on the contrary, I consider them to be a positive disadvantage, as the squashing of the indiarubber washers allows freedom and play to the plates, so that they separate slightly from each other. It is far better, in my opinion, to screw the whole structure up as tight as possible. *Major Palliser.* 16 Dec. 1867.

531. You would adjust the thickness of the bolt with respect to its formation, so that when the penetration is brought to bear upon it, it shall stretch uniformly?—I wish that there should be a certain portion of the bolt of a sufficient length left weaker than any other part of the bolt, so that it will stretch in the reduced part before any other part can break. Ordinarily good iron will stretch upwards of 20 per cent. of its original length before it breaks. Supposing that a portion of these bolts 5 inches long were reduced till weaker than any other part of the bolt, this reduced part would stretch upwards of one inch beyond its original length before it broke. If you measure the total length of both pieces of an ordinary bolt which is broken, you will find that it had not stretched at all.

532. (*Sir William Gordon.*) Do you know upon what method the target we have been speaking of is to be re-bolted, and will you state whether you approve of it?—I approve of everything with the exception of the shank of the bolts being still rather too thick. I should prefer that they should

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be still more reduced, and I think that the result of the experiments to be made will show that *some* of the *bolts will break in the screw thread.* I think that generally they will hold, but that some few which are the most strained will go in the screw thread. If their shanks were still more reduced, I do not think that they would go at all, unless they were pulled clean in two.

533. (*Colonel Adye.*) With reference to the target which is now being repaired with bolts of your construction, has the weakness which you pointed out just now been remedied?—I understand that it has been; that the heads have been properly made.

534. And they are now to be of your construction?—I understand so; but I should prefer the shanks being still more reduced.

535. Do you believe that the bolts will not give way again?—I do not think they will break at the head.

536. Do you not think that the rigidity of the target and the two plates being brought in contact when the surfaces were not quite plane, also tended very much to strain the bolts?—I think that there is a tendency to shear.

537. Do you not think that the rigidity of a target will always tend to break the bolts in the absence of an elastic backing, such as wood?—No. I think that a wood backing does away with the tendency to shear, for the wood is so soft that the bolt sinks into the wood on either side.

538. Supposing that you had two plates, as in the Gibraltar shield, and a wooden backing, would there not still be a tendency to shear between the two plates?—I think so: that is to say, if the target bends inwards under the blow, or the pressure of a shot, then plates that were originally flat will represent two different arcs, the bolt-holes will, therefore, no longer remain opposite each other, and hence there will be a tendency to shear.

539. Do you not think that the tendency to shear would be finally overcome by a separation of the iron plates by means of backing or horizontal stringers, or other means?—They are in contact on horizontal stringers through the wood.

540. Do you not think that the fact of two plates being close together must always give a tendency to shear, except by separating the plates?—I think they would have a tendency to shear if they are buckled inwards. If you could keep them flat, there will not be a tendency to shear. With regard to the tendency to shearing, although I do not wish to say that I think it can be thoroughly obviated in the Gibraltar shield, it will undoubtedly be very much modified by rounding off the bolt-holes, which has been carried out in this shield.

541. With two plates in conjunction, any lateral motion of either will create a tendency to shear; but if you put something between them, any lateral motion would cause simply a slight bending of the bolts?—Quite so.

542. Is not that an inevitable defect in a shield which has two plates close together?—If the plates were like that [explaining by a sketch], and the bolts running through them, then undoubtedly, as you say, there would be a great tendency to shearing, because the slightest lateral motion would cause it; but if they were to round off the bolt-holes to a considerable extent in that way [describing], the tendency to shearing would be very much reduced. I think that the two plates could be put together with bolt-holes rounded in that way, and if the struts or the backing were sufficient to keep them rigid, there would be no tendency to shearing.

543. Do you believe that any bolts can ever be made to hold together a perfectly rigid structure?—I do.

544. In the same way that you might hold together a structure with an elastic backing to some extent?—I think so; but I think that the shearing of a bolt is quite a distinct thing from pulling it in two. It used to be said that bolts were broken by vibration or by a jar, but I disbelieve that altogether; I don't understand what it even means. I think a bolt must sometimes either stretch or break, and if it cannot stretch it must break.

545. You have seen some experiments, in which some of your own bolts have stood a very great amount of hammering, with a wooden backing, but in the other case, without any elastic backing, a very large number of bolts went?—But they went at the head. They were not my bolts.

546. From the cause which you have already mentioned?—Yes; I think so. The front plate was 5½ inches thick; had, therefore, the heads been *shorn* off, they would have been at least 5½ inches long. All the broken heads are only 4 inches long, and, further, they are broken at the junction of the coned head and the cylindrical shank. It is evident that they failed owing to the heads having been "jumped."

547. (*Chairman.*) Is there anything further that you wish to add to your evidence?—Yes; there is one thing that I should like to say about the strain that is brought upon the bolts, which has reference to the elastic backing, that there are situations, with a wooden backing, where the strain on the bolt is very great indeed. I will suppose this [describing by a sketch] to be a plate, and this a wooden backing, and this the inner skin. When a shot penetrates this plate [pointing to the same], and the backing, and presses upon the skin, it sometimes has just got force enough to press strongly against the skin, but not quite enough to get through it, and then it bulges the skin out in that manner [describing]. In some instances I consider that some of the bolts have been stretched upwards of half-an-inch, by the dead pressure of the shot upon the skin of the target, and I consider that the strain brought upon a bolt in that way is as great a strain as you can bring upon a bolt in any other way. I have seen the backing of a target appear like the cushion of a stuffed chair, that is to say, the skin has been held in by the bolts, although considerably bulged between the bolts by spherical and round-headed shot which had lodged in the backing of the target. I consider that the strain brought upon bolts in that way is the greatest that can be brought them.

(The witness withdrew.)

Adjourned till Saturday next at two o'clock.

Saturday, 21st December, 1867.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Chair.*

Major-General Sir WILLIAM GORDON, K.C.B., R.E.
Colonel ADYE, C.B., R.A.
Lieutenant-Colonel WARD, R.E.
Dr. PERCY, F.R.S.
Dr. POLE, F.R.S.

Captain HARRISON, R.A., *Secretary.*

Mr. GEORGE WILSON examined.

548. (*Chairman.*) You are Managing Director of the Cyclops Iron and Steel Works of Messrs. Cammell and Company, at Sheffield?—Yes.

549. You have been requested to attend here to-day to give the Committee some information as to the mode of manufacture and construction of certain shields which have been made by you for the protection of guns at Gibraltar and Malta. Can you produce to the Committee the designs and the estimates upon which those shields were made by your firm?—I can do so, but I have not brought them with me to-day.

550. Can you give the Committee any information as to the communications which were made to you on the subject of those shields, and the nature of the changes in the design which were made during the process of manufacture?—The original design that was sent to us, and upon which our tender was based, was composed, I think, of two 6-inch front plates, an intermediate port plate 7 inches thick, and on each side of this intermediate plate were bridge sections of iron 7 inches deep, and a skin plate of, I think, 2 inches in thickness; the struts were as upon the model that we supplied to the War Office, which I believe is the one I see before me. When our tender was accepted, I saw Colonel Jervois and Colonel Inglis, and I was asked whether I could suggest any improvement in the mode of constructing this shield. I then advised that the 7-inch bridge sections should be dispensed with, and solid armour put in their place; but as this would increase the cost materially, it was considered how we could substitute solid armour for the bridge sections, and still keep the cost of the shield at the price of our tender. The only way in which that could be done was by lessening the thickness of the front of the shield, and it was then suggested that half-an-inch should be taken off the front plates, reducing them thereby to $5\frac{1}{2}$ inches, that half-an-inch should be taken off the skin, reducing that to an inch and a-half, and that 2 inches should be taken off the intermediate plates, bringing them down to 5 inches in thickness, which reduced the cost, I think, to about the original price at which we tendered. I did say at the time that these reductions would diminish the resisting qualities of the target, but Colonel Jervois' reply was that the target was purposely designed to be afterwards strengthened at any time when occasion required it, which set aside the objection that I expressed, because you can of course put more armour on upon the system on which these shields are designed.

551. What was the total thickness of the whole shield as it was at first designed?—I think 15 inches, but the original drawings will show that.

552. Shall you be able to submit them to the Committee?—Yes, I will do so; and they will also show the alterations that were adopted.

553. Was your firm also the makers of the bolts as well as of the armour?—Yes.

554. Were those bolts made under the direction of the War Office, or under the special direction of the designer of the bolts, Major Palliser?—We had no communication with Major Palliser at all, nor had we any instructions as to the making of the bolts, but they were to be made subject to the inspection of officers from the War Office.

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555. Had you had any experience in making armour shields for fortifications before?—No; those were the first shields that we had constructed.

556. Did it occur to you that the passing of the bolts through the series of plates to be struck by the shot would probably cause a shearing action on the bolts, as well as the ordinary strain to which they would be subjected?—It did not strike me until afterwards. I may say not until the shields had been dispatched from our works.

557. Had you had much experience of the comparative resisting power of shields when opposed to guns?—Only from what I had seen in the experiments made at Shoeburyness.

558. You had no information that we are not able to obtain from the ordinary sources accessible to the Government?—No.

559. Can you give the Committee any information as to the nature of the plates which have been tried, and which appear to have been of good quality?*—The plates were made with our usual care. We have but one system in our works that we adopt. Our desire has been to get plates as soft as possible, yet offering at the same time the greatest resistance, as soundly made as possible, and entirely free from crystals, if such can be obtained. I have brought some specimens with me to show the Committee the uniformity with which all our plates of various thicknesses have been made.

560. (*Colonel Adye.*) Why did you object to what you have spoken of as the bridge section in constructing the target?—Because I considered that the $5\frac{1}{2}$ or 6-inch plate which covered them would be comparatively easy of penetration, and, in case of a shell getting into the open spaces there, it would have resulted in very great destruction to that part of the target. I therefore thought that a solid plate would be preferable to bridge sections of iron.

561. You did not propose to leave empty spaces in the bridge sections, and fill them up with wood?—I did not understand that wood was to be used at all, and if it had been so, I consider that it would not have removed my objection to the use of the bridge section.

562. After the experiments which have been made, are you now of the same opinion that the junction of two solid plates is better than two separate plates divided by some kind of backing; or, in other words, do you think it advisable, after what you have seen, that two solid plates should be brought together in immediate contact?—I am distinctly of that opinion, provided they are made thick enough.

* See Appendix VI., p. 107.

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563. (*Chairman.*) That is your opinion, looking at the shearing action which has taken place in the recent experiments upon the bolts?—I consider that the bolts are sources of great weakness: that is to say, that they are liable to cause very destructive effects behind when the nuts break off. The difficulty would be to design a shield that would obviate the use of bolts entirely.

564. But your suggestion was, as I understood you, that the two plates or three plates of solid iron should be bolted together in close contact?—My proposal was, that instead of using bridged sections I should use solid plates.

565. After witnessing the experiments which have been made, and the shearing action upon the bolts, does it not appear to you that there is an objection to having iron plates brought in close contact and bolted together?—If you do away with the bolts, I think there would be no objection to solid plates fitting on to each other.

566. But supposing the bolts are used, is it desirable, in your opinion, to bring two iron plates into immediate contact and bolt them together?—Not unless you resort to some means for the purpose of preventing the shearing action of the plates.

567. Can you state to the Committee what is the largest-sized solid plate in length, width, and depth, of a reliable quality, that you would be prepared to roll?—That is a very comprehensive question, because it would depend so much upon the cost.

568. Just for a moment disregard the question of cost?—If I were to put down special plant, and expend a very great deal of money, I have no doubt that I could roll a plate of the full size requisite for a shield, but it would be very costly.

569. What do you mean by the "full size"?—I think that is 12 feet by 8 feet 2.

570. What is the largest plate that you are prepared now to make at the Cyclops Works?—The widest plate is 5 feet 6, but by a slight and inexpensive alteration, I could roll plates 6 feet 6 inches wide with our present plant.

571. Of what thickness, being of good quality?—I have no hesitation in saying that I could maintain the quality up to 15 inches.

572. (*Colonel Adye.*) Do you consider that it would be attended with great additional expense if you were to advance from 6 feet 6 inches in width to 8 feet wide?—Yes; it would make a very material difference in the expense, and then I should have my doubts about the welding in the middle of the plates being, as it ought to be, perfectly sound.

573. (*Chairman.*) Would there be any very great increase in the cost of manufacturing iron plates, weight for weight, from an increase of the thickness?—Yes; there would be a material difference.

574. You have spoken of the possibility of doing away with the shearing action when two plates of iron are closely in contact; have you any proposal to make by which that shearing action might be overcome?—I am not prepared to-day to put any scheme before the Committee, but I should be very glad to take the subject into consideration, and to prepare drawings.

575. I thought you had some proposal of the kind to make?—It is not yet so complete as I should like to make it. We learn a good deal by witnessing the experiments which are made, and the one on Thursday last at Shoeburyness has caused me to reconsider my views. I shall be prepared, I think, in the course of a week or two, to bring a design before the Committee, but I should like to put it in as complete a shape as possible before submitting it.

576. (*Mr. Pole.*) With regard to the shearing of the bolts, have you seen the plan which has been adopted partially in the present shield, and which might probably be more extensively carried out, of counter-sinking the holes, which plan has been adopted upon railways to prevent the chairs from shearing by side blows of the train, and do you not think that it might be usefully adopted?—I think the counter-sinking of the holes might be applied with advantage where bolts are used in these structures.

577. So that considerable motion might be permitted in the plates without shearing the bolts?—Yes.

578. You still, do you not, endeavour to make the plates as soft as possible?—Yes.

579. You have seen no reason to doubt the soundness of the conclusion come to by the Iron Plate Committee, that softness was a very essential quality, and that hardness was objectionable?—Decidedly not.

580. Nothing which you have witnessed in the experiments carried on since that time has disturbed your impression?—No; on the contrary, everything has tended to confirm it.

581. Do you succeed as perfectly as you could wish in securing good welding in the various layers of the plates?—Quite so.

582. Up to what thickness do you secure good welding?—I may say as far as we have yet gone, and we are now rolling plates 10 inches in thickness, but I could not have said so two years ago.

583. Since the Iron Plate Committee was dissolved, in 1864, when they pointed attention to the lamination of iron plates as a defect, you think that you have got over the difficulty, and that you can now depend upon the plates being soundly welded?—Yes; I may say, I think, that we never have a badly welded plate now.

584. When they are broken up by shot, do they not laminate as they used to do?—No.

585. I suppose you pile in horizontal layers as before, but you make sure that they are better welded than they were before?—Yes.

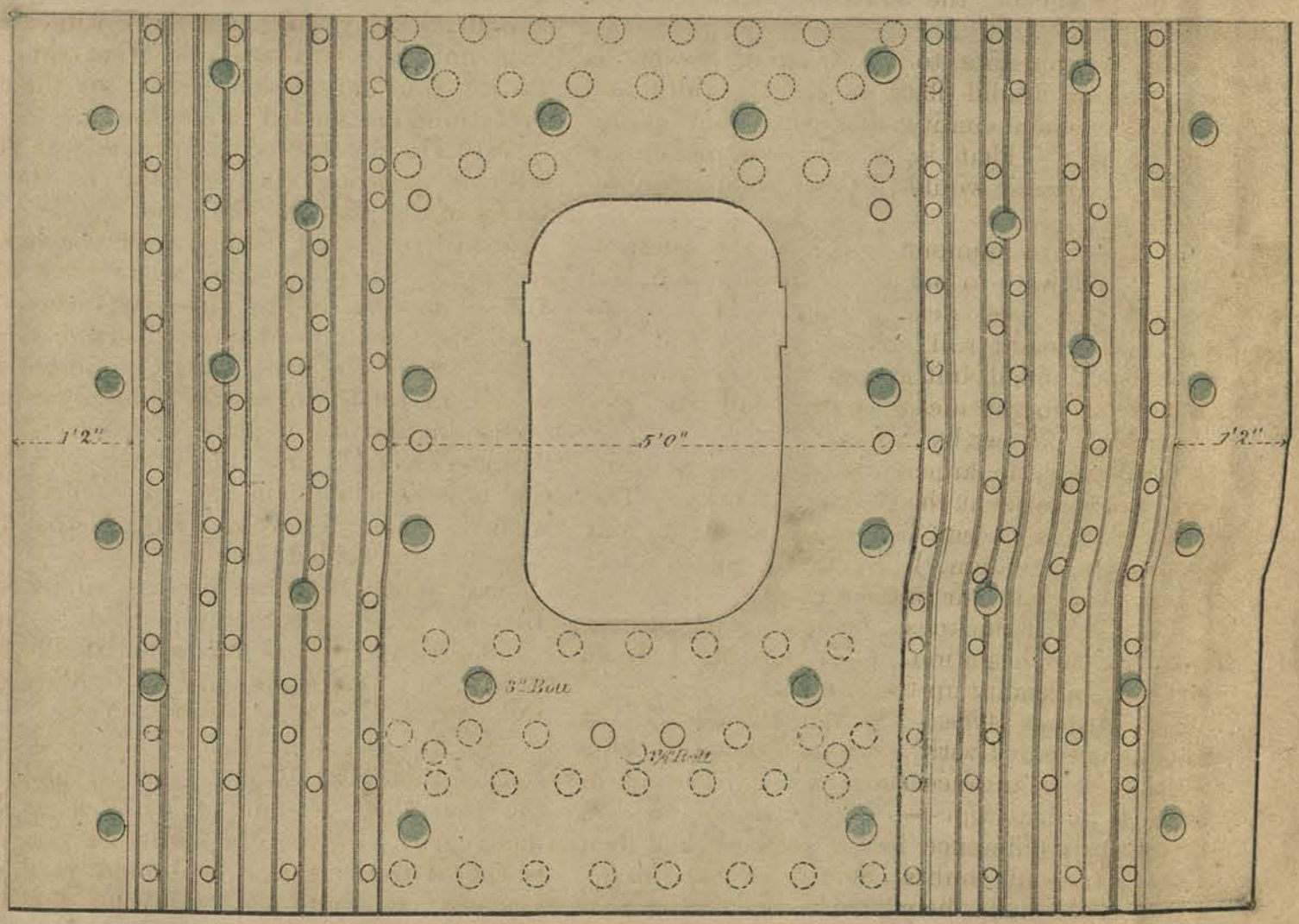
586. Do you think that in the case of plates thicker than 5 inches or $5\frac{1}{2}$ inches, the law which the Iron Plate Committee adopted as approximately true, viz., that the resistance varies as the square of the thickness, will hold good, or have you any idea up to what thickness that law will hold good; for example, up to $7\frac{1}{2}$ inches, do plates increase in strength, or are they as strong in proportion as thinner plates?—A solid thick plate is, no doubt, stronger than a series of thinner plates making up the same thickness, but beyond 5 or $5\frac{1}{2}$ inches, I should say, not in the proportion mentioned.

587. Not in the case of the thickest plates?—No; if you apply that rule to a 10-inch plate, a hundred 1-inch plates would be only equal in resistance to one 10-inch solid plate; and you would then say that 8 feet 4 inches of iron would be no more than equal to one 10-inch plate.

588. The Iron Plate Committee found that the law held good up to, I think, about 5 inches; do you think that it would hold good up to 7 or $7\frac{1}{2}$ inches, or would a plate about 7 inches thick be twice as strong as a plate 5 inches thick, as it ought to be upon that theory?—No, there is a limit somewhere, but that can only be deter-

IRON SHIELD FOR COAST DEFENCES

NOT CARRIED OUT



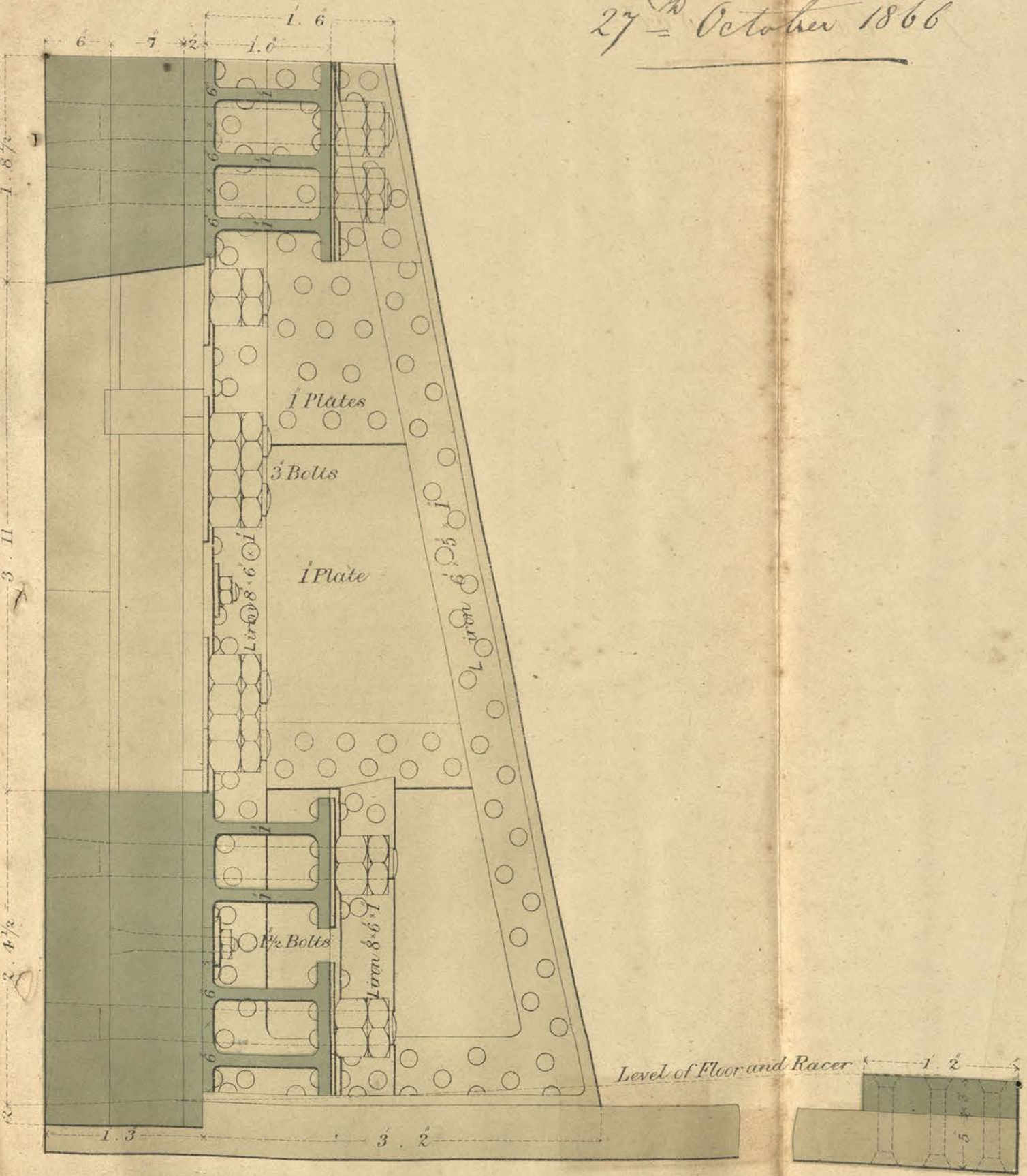
FRONT ELEVATION WITH ARMOUR PLATE REMOVED

Scale ½ In 1 Foot

IRON SHIELD FOR COAST DEFENCES.

NOT CARRIED OUT.

Wm F. Drummond Servoss
27th October 1866



VERTICAL SECTION THRO' EMBRASURE.

Scale 1 Inch-1 Foot.

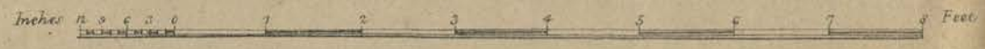
Feet 0 1 2 3

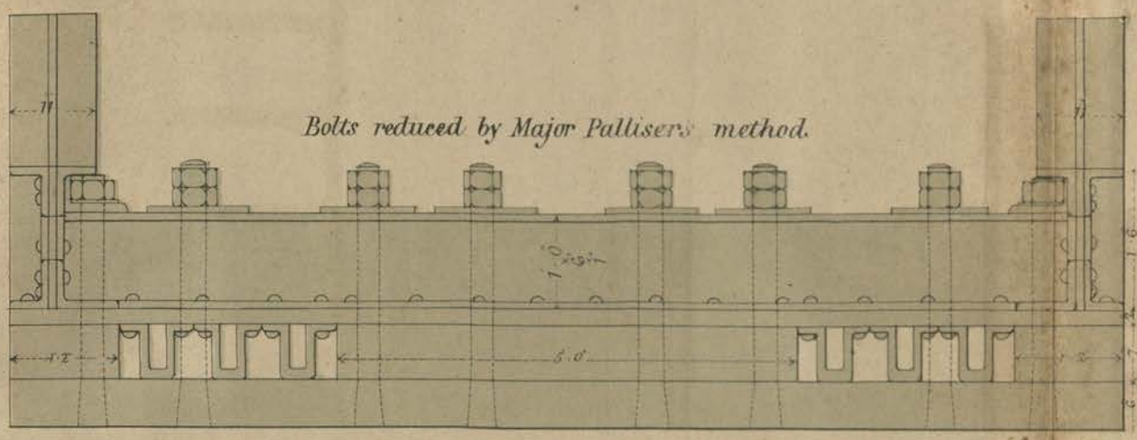
0 3 6 9 12 Inches

IRON SHIELD FOR COAST DEFENCES

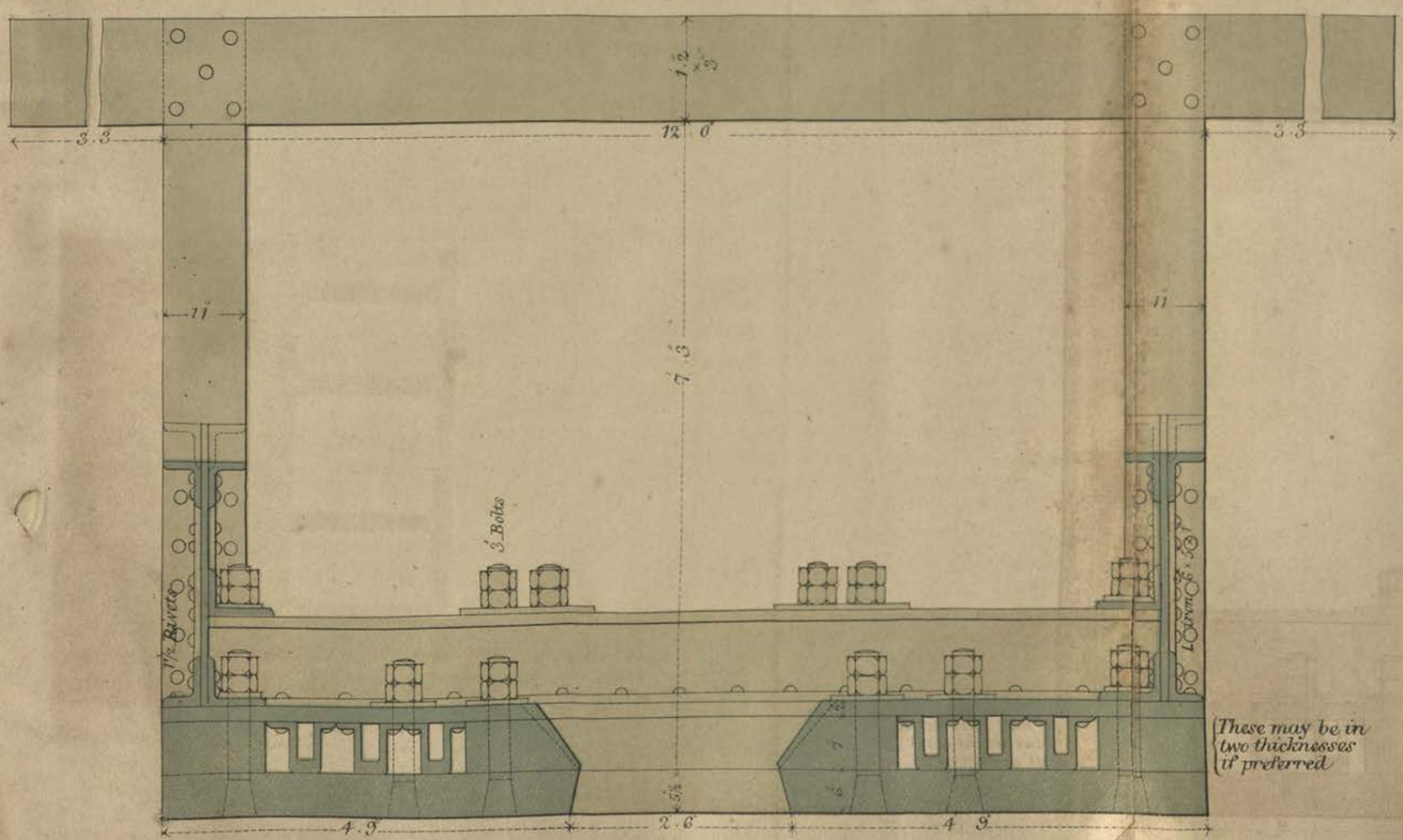
NOT CARRIED OUT.

Scale ½ In. = 1 Foot.





TOP PLAN.



SECTIONAL PLAN THRO' EMBRASURE

Wm F. Drummond Servos

mined by actual experiment; where that limit is I cannot say.

589. Have you found any falling off in the quality of very thick plates: do they break more crystalline than thin ones?—No; the samples which I have brought with me to-day will show the Committee that they are quite as good as the thinner ones.

590. Of what thickness are they?—Of 6, 7, 8, and 9 inches.

591. At 9 inches can you depend upon softness, and an absence of all crystals?—I can depend upon a greater thickness than 9 inches being without crystals.

592. Would it always break fibrous, and be, as you believe, of soft quality?—Yes, we guarantee that.

593. Should you have any difficulty in making what are called planks. You will remember, probably, the shield supplied by Colonel Inglis to the Iron Plate Committee, in which planks were used: take a bar of about 2 feet by 7 inches thick and 7 or 8 feet long, should you have any difficulty in making planks of that size, or more difficulty than in making the larger plates which you at present make?—No; I should say we should not have more difficulty in regard to the manufacture.

594. Would it not require a longer time, or more preparation, than to make a plate for which you have rollers?—We should have to cut special rolls for the manufacture of them.

595. That being done the manufacture would not be difficult?—Not at all.

596. Nor need they be more expensive than plates of the same weight?—No.

597. Supposing you had to prepare a design for strengthening the shield you have already made, are you prepared to state to the Committee what you would do?—My opinion is that the shield is chiefly defective in weight of metal, that is, that you want about 6 inches more of armour-plating on the shield, as far as that particular design of shield goes.

598. How would you apply that, to the plate in front?—I should put it on between the skin-plate and the intermediate plates, in a manner to break the joint of the first plates, and my reason for putting it there would be to give support to the three intermediate plates, and to get a bearing for resistance to any percussion or blow, that would be taken up by the struts in the same way as is now done by the two front plates, each of which have a bearing upon the struts.

599. Do you see any objection to a thin plate at the back; would that be disadvantageous?—Not at all.

600. Not considering the chances of its being knocked to pieces, and the pieces being scattered about among the men?—No; because if this additional thickness were put upon the shield, I do not think the skin would be affected.

601. You think that it would be so strong in the middle that the back plate would not be affected?—Yes; I think that no gun we have as yet would penetrate that shield.

602. If so altered?—Yes.

603. Is the back plate particularly necessary for the sake of bolting the girders to it?—I think that that was the chief object of putting it there.

604. (*Chairman.*) Would you prefer to insert an additional plate, as you now propose, to removing the present front plate and placing there a thicker one?—In the first place, as a question of cost, I would adopt my proposal, because the counter-sunk holes are all in the front plates now, whereas you would have to throw away your front plates entirely to put in the additional thickness you speak of, and I think that by putting in the $5\frac{1}{2}$ or 6-inch plate that I suggest, you would get the result required at a much less cost, than by putting in the front a thicker plate, and throwing the two front plates away. As to drilling the holes, we have in our works all the original templets from which these were set out, and perfect accuracy in that respect could be guaranteed.

605. Have you read the Report of the Iron Plate Committee?—I have only read portions of it.

606. Are you aware that they recommend that the front plate should not be less than $7\frac{1}{2}$ inches in thickness to resist the kind of gun to be used?—That I have not had brought under my observation.

607. If this kind of shield were to be made again, would you prefer the compound structure you have now spoken of, or a $7\frac{1}{2}$-inch, or a thicker plate, as the front plate with the present arrangement of plates in the rear, to what you have suggested?—In that case, I should prefer a thicker plate in the front, after what I saw on Thursday last at Shoeburyness. I would endeavour to do away with the bolts and obviate the shearing action of the plates.

608. (*Dr. Percy.*) It has been stated that these bolts were not manufactured on the right principle; will you state to the Committee how they were made?—They were made from 3-inch rolled iron cut off into the required lengths, and the heads were upset under a steam hammer in dies: a part of the body of the bolt was turned down to a smaller diameter, from the thread upwards.

609. The upsetting process was particularly complained of; what has been your experience upon that point; has it an influence on the bolt?—In the first instance, I thought it was a very material point, but since the breakage of the bolts at Shoeburyness on the occasion of the first trial, I have had one of the bolts back to my works, and I have cut up the head into four pieces, and also the shank of the same bolt corresponding to the fractured part of the head. I have worked them up with acid, and have not been able to see any material disturbance of the fibre of the iron in the upsetting, to account for the breakage that took place.

610. Although you have stated that your object is to obtain iron free from crystals, how would you describe the fracture of the plates of your manufacture that we saw the other day?—Crystals appear where a violent fracture takes place.

611. Then the fracture would be crystalline?—Yes, in that case.

612. Did you ever see it otherwise in the case of the best iron after a plate had been broken by a shot at a high velocity?—I have seen some portions of the plate fibrous, and other parts of it crystalline.

613. It has been stated to the Committee that some of the plates, when they reached Shoeburyness, were more or less curved, and that in consequence of that curvature, they could not be brought flat upon each other; do you know anything about that?—There might, perhaps, have been a spring of the $\frac{1}{16}$th of an inch, or something of that sort, at the corners.

614. Do you mean caused after they had left

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your works?—Yes; each shield was drawn up by bolts and fitted together complete in our works, and whether there was the $\frac{1}{16}$th of an inch or the $\frac{1}{8}$th of an inch set in the corners, the bolts were supposed to draw them up and to make a close fit.

615. It has been stated that the curvature was much greater in the case of the shield that was put up at Shoeburyness?—It may have been occasioned by throwing it out of a railway truck, or something of that kind.

616. Do you think that that would account for it?—It depends upon how it fell, and what it fell upon; there is a narrow part at the top of the upper plate which would bend or cause a set if not carefully handled.

617. At your works do you apply any mechanical test to determine the comparative hardness of the iron?—Only the usual method of measuring the compression under a given force.

618. Supposing you were asked the question whether one plate was harder than another, of course the difference would be very small in every case, could you suggest any mode of testing such hardness, so as to obtain true results?—Only by the expensive method of cutting a piece out, and putting it into a machine, and trying it by compression.

619. You have spoken of the softness of the plate as the quality most to be aimed at in the manufacture of these plates?—Yes.

620. I presume that that is on account of the impossibility of getting hardness of corresponding utility. If you could obtain hard metal, which was at the same time very tough, would your opinion remain the same?—It is very difficult to obtain it.

621. Is not your objection to hardness on account of the brittleness which accompanies it?—Yes; we have long been in search of the metal you refer to, but we have always found it accompanied by a certain degree of brittleness and tendency to fracture.

622. (*Colonel Ward.*) I believe you were present at the experiments made at Shoeburyness on the occasion when the shield was first fired at?—No.

623 Did you see the bolts that broke on that occasion?—Yes; I went down some days afterwards and saw the bolts that were broken.

624. Did you see any bolts that broke immediately under the conical head?—Yes; I saw several.

625. Broken immediately under the head?—Yes; immediately underneath the conical part, and at the back of front plate, at the shearing between the first and second plates.

626. Where the nip took place?—Yes.

627. If there was anything wrong in the upsetting of the bolts, would they not break at the conical part?—Yes; I should have said so.

628. If they were to break down the shank, would that lead you to think that there was anything wrong in the upsetting of the head?—No.

629. As a matter of fact, what conclusion did you arrive at after seeing the bolts that were broken?—I came to this conclusion, that some of the iron was originally too hard for the bolts.

630. Do you think that the upsetting of the bolts had anything to do with the breaking of the bolts?—I have not been able to discover that it had, from the experiments which I have since made.

631. Are you aware that means were resorted to at the second trial to prevent the shearing o the bolts?—Yes.

632. Do you think that those means effected the object intended?—I think they were a very great improvement upon the first construction.

633. So far as the bolts were concerned on the second occasion they were successful?—I considered that they were highly successful.

634. Have you any contracts for making plates for the Admiralty?—Yes.

635. Of what size and thickness, or do you make plates for the Admiralty of the greatest size and thickness now?—We are now asked to roll plates 19 feet long by 3 feet wide, and 10 inches thick.

636. At what cost per ton can you furnish such plates?—Our price for those plates is 36*l.* per ton.

637. If you were to make planks of not more than 18 inches wide, and of the same thickness, what would be the cost per ton?—They would cost as much as an armour-plate, or within 1*l.* a-ton of it.

638. If you were required to make a plate in one piece the size of the shield, and 12 inches thick, what do you think would be the cost per ton?—So much would depend upon the amount of money that I had first to lay out upon special plant for the purpose, that I could scarcely give you a reliable answer to that question without first calculating the necessary outlay.

639. Do you think it would be possible to do it?—Yes; it would be possible to do it, if the cost were not a material objection.

640. If you received a large order for plates of that kind, can you give the Committee any idea of the probable cost?—I can give them only a wide range. I should think from 50*l.* to 60*l.* a ton.

641. How long would it take to prepare the necessary machinery to roll such large plates?—Fully six months, say from that to seven or eight months.

642. Do you roll plates as large as are rolled by any other firm?—We can do so if they are ordered.

643. As readily as any other firm?—Quite so.

644. (*Colonel Adye.*) Do you think that the improvement in the bolts when the Gibraltar shield was on the second occasion fired at, at Shoeburyness, was caused by the additional washers that were used, the wooden casing, or the bevelling off of the edges of the holes?—It arose first of all from an improvement in the quality of the iron that was used, and which was only known after the first experiment had been made. I have no doubt that the bevelling off of the edges, the packing of the wood round them, and the wooden washers used, also contributed to the improvement.

645. (*Dr. Pole.*) Did you make the iron for the last bolts?—Yes; they were all made out of 4-inch iron drawn down with the hammer, the heads not being upset.

646. Were they drawn down or turned, or both?—They were drawn down under the steam hammer, and turned on the skin afterwards.

647. Would it not improve them if you could do away with the turning, and let the iron have a natural skin. Could they not be forged with sufficient accuracy to do away with the turning, and leave them with their natural strength of skin?—Yes; but where a conical head is used they must be turned to ensure a proper fit into the plates.

648. (*Colonel Adye.*) Have you any objection

to state how much per ton you would charge for plates, 5, 8, or 10 inches thick, the length and breadth being the same?—Our last tender to the Admiralty was, for plates 7 inches thick, 30*l.* a ton; 8 inches thick, 31*l.* a ton; 9 inches thick, 33*l.* a ton; 10 inches thick, 36*l.* a ton; and we are now working upon orders based on those terms.

649. (*Chairman.*) What is the greatest weight, length, and breadth at which those varying thicknesses can be produced?—We can produce plates up to 5 feet 6 inches wide of the thicknesses mentioned, and of any convenient length. We are making 10-inch plates 19 feet long and 3 feet wide. I should say up to 25 feet in length.

650. (*Colonel Adye.*) Have you made any experiments at your works as to the best fastenings or bolts, and if so, will you shortly mention the results?—I have made a series of experiments since the first trial of the shield was made. I have made a record of them, as the results were obtained at the time, in a book which I shall be happy to place at the disposal of the Committee. (These experiments follow 670).

651. (*Dr. Pole.*) You know that the Iron Plate Committee formed an unfavourable opinion of the use of steel for armour purposes, but since that time there has been a good deal of progress made in the manufacture of steel. Have you seen anything to lead you to hope that steel might be used with effect as armour in the place of iron, or do you think, as the Iron Plate Committee thought, that soft iron is the best?—I am still of opinion that soft iron is the best material that can be used for armour-plates, and that there are great practical difficulties in working steel in huge masses; but since the experiments which were made at Shoeburyness by the Ordnance Select Committee, in which plates composed of steel and iron were tried, I have been trying to make a solid steel plate 7 inches thick, but I have not succeeded as yet in making a satisfactory armour-plate of steel.

652. (*Chairman.*) Was that by Bessemer's process?—Both by that, and upon my own principle.

653. When you were making these experiments had you any reliable evidence as to the success or otherwise of Krupp by the same process?—No; I have never heard that Krupp had succeeded with armour-plates, but I have heard that he has failed to make a good armour-plate of steel.

654. He has not been able by the crucible process to manufacture large masses of steel for this purpose?—No.

655. (*Colonel Adye.*) I believe you made the bolts of the Gibraltar shield for both the trials?—Yes, we did.

656. You have stated that on the second occasion you considered the metal in the bolts had been much improved. What was the difference in the quality of the iron?—It was softer iron and perfectly fibrous, so much so that the bars from which the second bolts were made being 4 inches in diameter, we bent them round cold, the ends touching each other, without fracture.

657. Did you try a similar experiment with the first set of bolts?—Yes, we did; but I must explain to the Committee that there were two classes of iron used in the first set of bolts that were made. In the portion that was made by ourselves, the iron was, I may say, almost as good as the iron in the second lot of bolts that we supplied for the tested shield, but the other iron was too hard, judging from what I have since seen.

658. And that iron was not made by your firm?—No.

659 Did the bolts which were of your own make, or the bolts of the other make, at the first experiment chiefly give way?—The bolts of the other make.

660. (*Chairman.*) Are the present bolts exactly of the same form as the former ones?—No; we have turned down the shank of the second set of bolts to 2·75 diameter through their whole length, from the foot of the cone to the commencement of the thread; whereas in the first set of bolts they were only turned down distances varying from 4 to 9 or 10 inches, according to the length of the bolts.

661. Is there much greater endurance in a bolt so treated than in a bolt of the other form?—I think there is.

662. (*Dr. Percy.*) With respect to the hardness and softness of the two qualities of iron, was the difference due to a variation in the quality of the pig-iron from which the manufactured iron was made, or to a difference in the process of manufacture, or to both?—To one as much as to the other, from the same class of pig-iron that we now use we can make a plate perfectly brittle.

663. Upon what does that brittleness depend?—It depends upon the hardness of the iron.

664. Is it chemical or mechanical?—I have analysed a number of specimens, and I have not been able to satisfy myself chemically upon the point, but mechanically I can quite understand it.

665. (*Chairman.*) It is to be reduced by annealing afterwards is it not?—Not to the required extent, but it can be remedied slightly.

666. (*Colonel Adye.*) Do you attribute the improvement in the bolts on the second occasion of the trial of the Gibraltar shield chiefly to improved metal, or to the improved model of the bolts?—I think that both alterations had a material effect in improving the bolts.

667. In about an equal degree?—Yes; I should say equally.

668. (*Dr. Percy.*) One of your plates was found to be decidedly harder than others.* Can you describe to the Committee what mode of testing was adopted; it was a 5-inch plate, No. 2, and weighed 15 cwt., and it was sent to Shoeburyness to be tested on the 28th of January last?—Yes; I remember the circumstance, and I think it was the port hole, simply the piece cut out for the port-hole; and I think a mistake was made if the fracture of that test-plate was described as due to hardness; in my opinion the fracture of that plate was due entirely to the smallness of the piece operated on. It weighed only 15 cwt., and measured 3 feet 10 inches by 2 feet 6 inches. The piece was too small for a test, and I objected to its being taken on that ground. If the whole plate had been tested it would have been found quite as good as any plate which had been previously sent. I have brought some specimens here with the view of showing the Committee that plates of varying thicknesses can be made of a perfectly uniform quality [producing the same].

669. (*Chairman.*) From what thickness of plate were these specimens taken?—From 6, 7, 8, and 9-inch plates.

670. Is there anything further that you wish to add to your evidence?—Nothing strikes me at present. If the Committee should desire to see any designs, when I have had time to prepare them, I shall be very glad to submit them to the Committee.

* See Appendix VI., p. 167.

(The witness withdrew.)

Adjourned till Monday, 6th January, at Two o'clock.

Mr. George Wilson.

31 Dec. 1867.

Experiments on 3-inch Bolts, for Iron Shields, made at the Cyclops Steel and Iron Works, Sheffield, November 1867.

All the bolts were tested in the following manner:—A piece of armour-plate, marked A on Fig. 1, 5 inches thick, had a conical hole drilled through the centre of plate, to receive the head of the bolt.

The bolt B to be tested was then put through the hole in armour-plate, and also through the cross-head, C; a washer was then put on, and the nuts screwed home. The armour-plate was next put on two supports, D and D, with the bolt downwards, and the cross-head resting on the nuts; a cross-bar, E, was then put on the two ears of the cross-head, directly under the tup, or falling weight, F.

It will thus be seen that the effect of the blow was transferred from the cross-bar and cross-head directly on the bolt, thus putting the bolt in tensile strain.

The weight of the tup was one ton, and the fall of tup in every case 30 feet.

Scale $\frac{3}{4}$" = 1 foot.

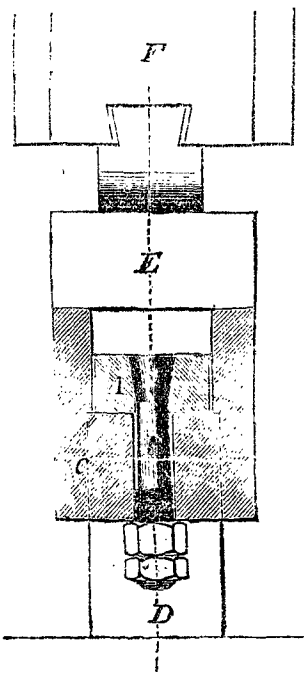


Fig. 1

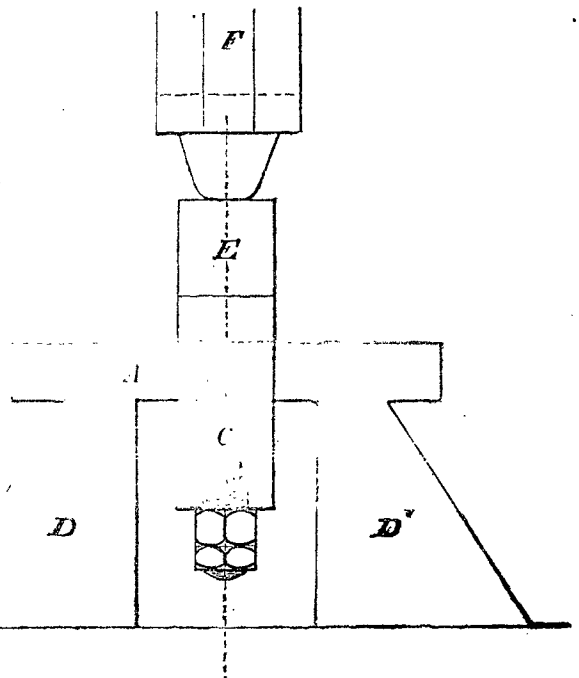
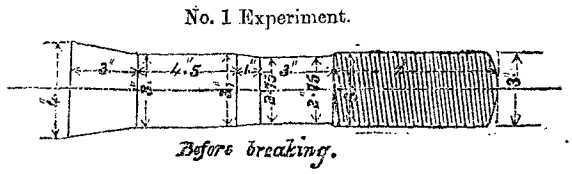


Fig. 2

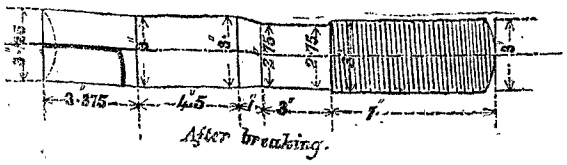
First Experiment.

This bolt was one originally made for the shields, and had a conical head. This head was formed in a die, under a steam hammer, being hammered down to the dimensions shown in sketch, from a bar of iron 3 inches diameter. This is the class of conical head which will be known in the succeeding experiments as an "upset conical head."

No. 1 Experiment.



Before breaking.



After breaking.

Number of blows	1	2	3
Elongation of bolt in inches ..	·75	1·125	1·325
Distance conical head was drawn in hole in armour plate	1·00	1·75	Drawn through hole

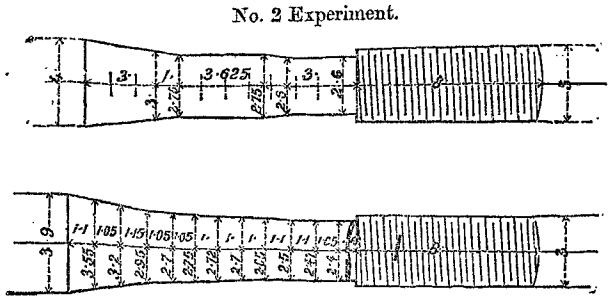
The third blow drew the conical head of bolt through the hole in armour-plate, with a total elongation of 1·325. The bolt was found to be fractured in the head, as indicated by the thick line.

The fracture of the iron was very fibrous.

Second Experiment.

This was a bolt made of the "Cyclops" iron, and the conical head was formed by drawing a piece of iron, 4 inches diameter, to the dimensions shown in sketch. This is the class of conical head which will be known in the succeeding experiments as a "drawn conical head."

No. 2 Experiment.



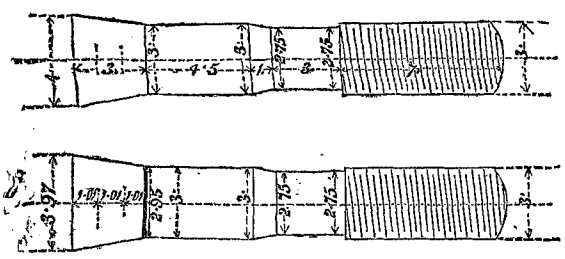
Number of blows	1
Elongation of bolt in inches	·65
Distance conical head was drawn in hole in armour plate	·25

First blow broke the bolt at a distance of 12 inches from the top of the conical head. There was also a small fracture inside the nut at a distance of 14½ inches from the top of conical head; both fractures are indicated by thick lines. The fractures showed the iron very fibrous.

Third Experiment.

This bolt was one originally made for the shields, and had an "upset conical head." This bolt was of the same class as bolt in first experiment.

No. 3 Experiment.



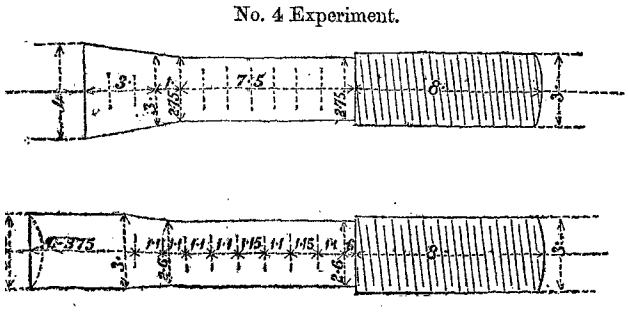
Number of blows	1
Elongation of bolt in inches	·3
Distance conical head was drawn in hole in armour plate	Nil.

First blow broke the bolt at a distance of 3·3 inches from the top of conical head, with an elongation of 3 inches. Fracture showed the iron very hard and granular. No work was done at all upon the body part of bolt, as that remained exactly the same after the blow as before. The fracture is indicated by a thick line.

Fourth Experiment.

This was a bolt made of the "Cyclops" iron, and had a "drawn conical head."

No. 4 Experiment.



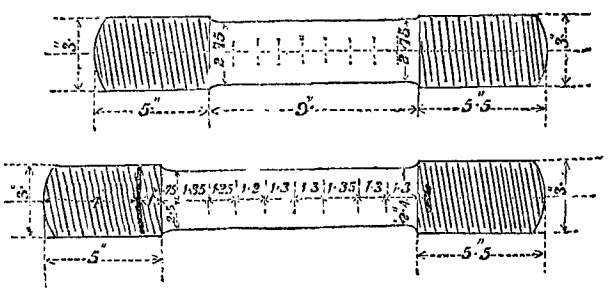
Number of blows	1	2	3
Elongation of bolt in inches ..	1·00	2·00	2·37
Distance conical head was drawn in hole in armour plate	·625	1·18	Drawn through hole

Third blow the conical head of bolt was drawn through the hole in armour-plate, with a total elongation of 2·37 inches. The bolt presented no flaw or crack of any kind.

Fifth Experiment.

This bolt was made of the "Cyclops" iron, and instead of having a conical head, was screwed into the armour-plate. The last one inch of the hole in 5-inch armour-plate was dished out, thus leaving a length of thread or screw of 4 inches in plate.

No. 5 Experiment.



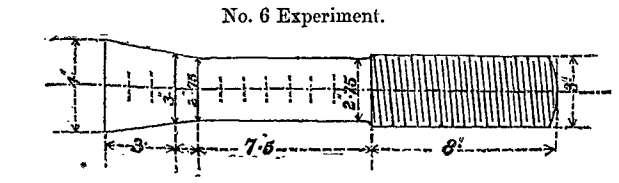
Number of blows	1	2	3
Elongation of bolt in inches ..	1·6	2·1	2·1

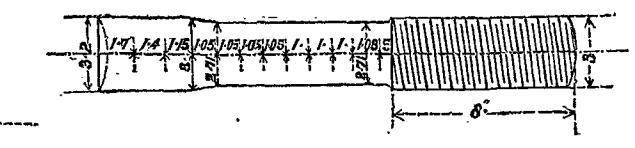
Third blow broke the bolt at a distance of 4 inches from end, screwed in armour-plate. This fracture was square across the bolt, and the iron appeared to have been punished very much; the fracture showed a half fibrous and half crystalline appearance. The bolt was also cracked a little in the thread on which the nuts were about 4½ inches from the end. Both fractures are indicated by the thick lines.

Sixth Experiment.

This was a steel bolt, unhardened, with a conical head, known as a "drawn conical head."

No. 6 Experiment.





Number of blows	1	2	3
Elongation of bolt in inches ..	·8	1·00	1·48
Distance conical head was drawn in hole in armour-plate	·62	1·37	Drawn through hole.

Mr. George Wilson.

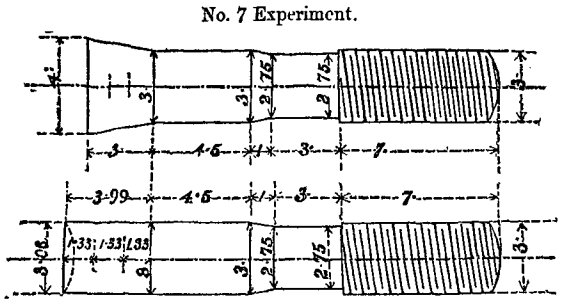
21 Dec. 1867.

Third blow drew the conical head through hole in armour-plate, without a fracture or flaw of any kind.

Seventh Experiment.

This bolt was one originally made for shields, and had an "upset conical head."

No. 7 Experiment.



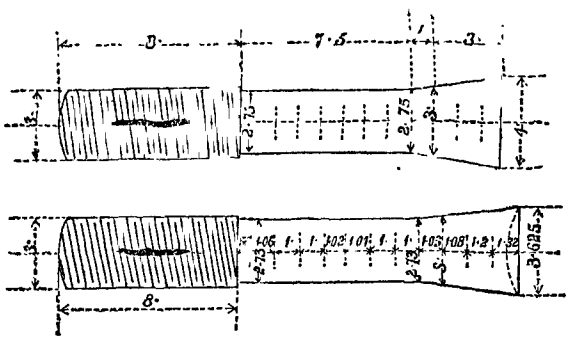
Number of blows	1	2
Elongation of bolt in inches ..	·75	1·00
Distance conical head was drawn in hole in armour-plate ..	0·99	Drawn through hole

Second blow drew the bolt through hole in armour-plate. The conical head alone extended 0·99 inch; there was no work done at all upon the body part of bolt, as no extension took place and no reduction in diameter.

Eighth Experiment.

This was a steel bolt hardened in oil, with a "drawn conical head" of same dimensions as bolts in No. 4 and 6 Experiments.

No. 8 Experiment.



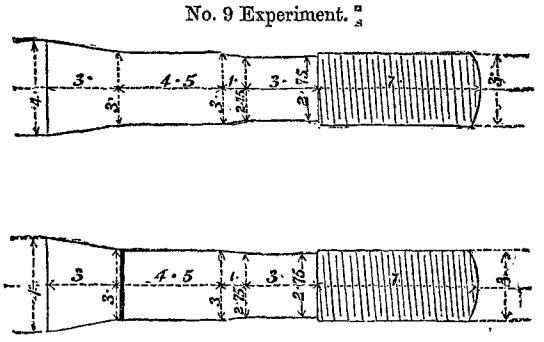
Number of blows ..	1	2	3	4
Elongation of bolt in inches	·12	·31	·75	·75
Distance conical head was drawn in hole in armour-plate	·5	1·56	2·87	Drawn through hole

The fourth blow drew the conical head through the hole in armour-plate. In hardening the bolt a very slight surface crack appeared on the thread, as shown by thick line, and, after four blows, opened out a little, but beyond this there was no crack or flaw of any description visible.

Ninth Experiment.

This bolt was one originally made for shields, and had an upset conical head. Some glue and coarse emery was put on the head of this bolt, to see if it would have a tendency to stop the head drawing through the conical hole in armour-plate. Also, only one nut, 2 inches thick, was put on the bolt to see if 2 inches of thread would shear before the bolt broke.

No. 9 Experiment.



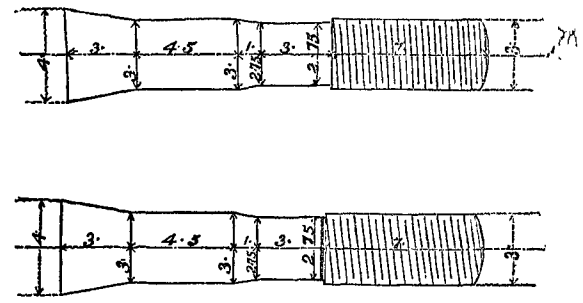
Number of blows	1
Elongation of bolt in inches..	Nil
Distance conical head was drawn in armour-plate	Nil

First blow broke the bolt at a distance of 3¹ inches from the top of conical head; the fracture was square across the bolt; iron very hard and brittle. No work was done at all in any part of the bolt, as it was the same dimensions after testing as before. The thread was not injured, and nut screwed off perfectly easy.

Tenth Experiment.

This bolt was one originally made for shields, and had an upset conical head. This bolt was tested under the same conditions, and to obtain the same results wanted in last experiment, No. 9.

No. 10 Experiment.



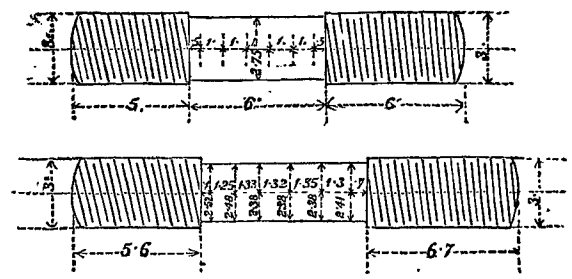
Number of blows	1
Elongation of bolt in inches	Nil
Distance conical head was drawn in armour-plate	Nil

First blow broke the bolt at a distance of 11½-inches from top of conical head; the fracture was square across; the bolts and iron very hard and brittle. No work was done at all on any part of the bolt. The nut and thread were not injured at all.

Eleventh Experiment.

This was a steel bolt, unhardened, and, instead of having a conical head, both ends of bolt were screwed, and one end screwed in armour-plate. The thread, 5-inch long on bolt, was screwed in the ordinary manner at the rate of 5 threads per inch, and then the last inch of this thread was again screwed at the rate of 5½ threads per inch. This was done to reduce the thread of bolt down to the diameter of body part of bolt in a gradual manner, thus leaving a length of 4 inches of full thread in armour-plate, and 1 inch of thread gradually reduced.

No. 11 Experiment.



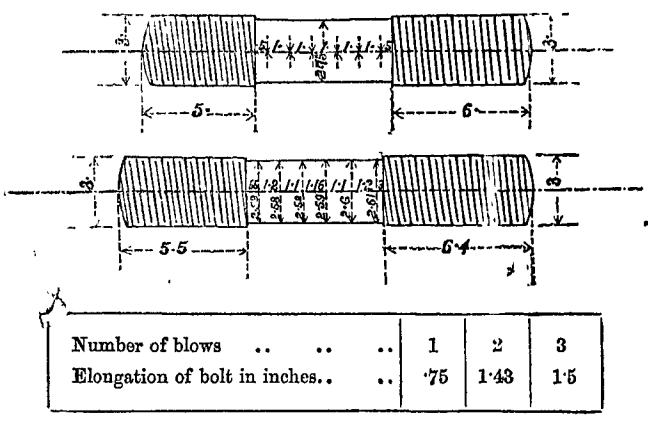
Number of blows	1	2	3	4
Elongation of bolt in inches ..	1·00	1·75	2·56	2·95

The fourth blow sheared the thread off in the armour-plate. The thread of the bolt was not injured, neither was there any flaw or crack of any kind visible on the bolt.

Twelfth Experiment.

This was a steel bolt, hardened, made exactly like bolt in last experiment, No. 11. There was a length of 4-inch full thread in armour-plate and 1 inch of thread gradually reduced.

No. 12 Experiment.



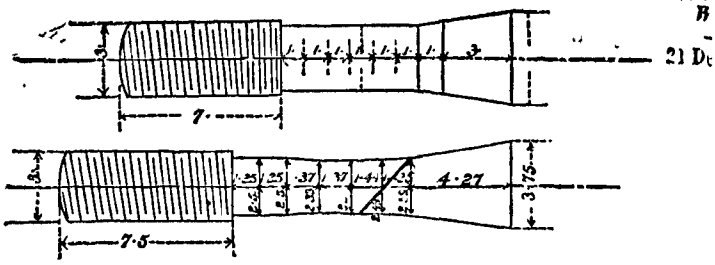
Number of blows	1	2	3
Elongation of bolt in inches	·75	1·43	1·5

Third blow sheared the thread in armour-plate. The steel thread was not injured, no crack or flaw visible in bolt.

Thirteenth Experiment.

This was a bolt made of the "Cyclops" iron, and had a drawn conical head, glue and emery was put on the head, as before explained; last inch of thread was also reduced as explained.

No. 13 Experiment.



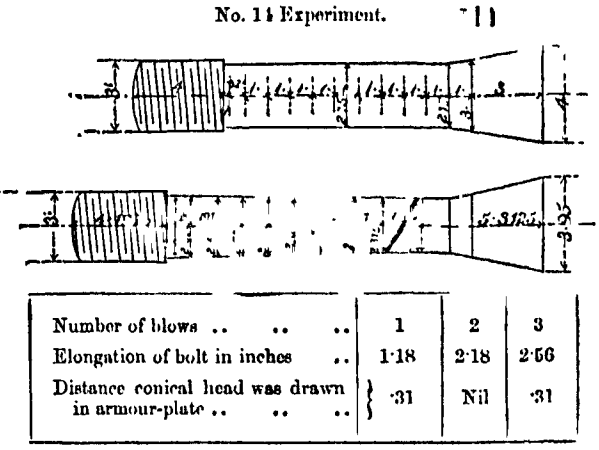
Number of blows	1	2	3
Elongation of bolt in inches ..	1·05	2·5	2·75
Distance conical head was drawn in armour-plate	·7	·9	1·0

Third blow broke the bolt as shown by thick line; fracture showed the iron fibrous and very good.

Fourteenth Experiment.

This was a bolt made of the "Cyclops" iron; the iron was drawn down from 4-inch diameter to 3½-inch, and then an upset conical head was formed. This bolt was tested with glue and emery, and had the last inch of thread reduced.

No. 14 Experiment.



Number of blows	1	2	3
Elongation of bolt in inches ..	1·18	2·18	2·56
Distance conical head was drawn in armour-plate	·31	Nil	·31

Third blow broke the bolt at a mean distance of 6¼ inches from top of conical head. The fracture showed the iron fibrous and remarkably good. It may here be remarked the morning was very frosty when this bolt was tested. A piece of "Cyclops" iron, from which the bolts were made in experiments, was tested in the testing-machine for tensile strain, the iron was rolled down to a plate 2 feet long, 6½ inches wide, 1 inch thick, and the piece to be fractured was left 9 inches long by 1 inch square. The iron broke at 25 tons 6 cwt. per square inch, with an elongation in 9 inches of ·52 inches of an inch. The fracture showed the iron fibrous and remarkably good.

Mr. John D. Ellis.

6 Jan. 1868.

Monday, January 6th, 1868.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Chair.*

Major-General Sir WILLIAM GORDON, K.C.B., R.E.
Colonel ADYE, C.B., R.A.
Lieutenant-Colonel WARD, R.E.
Mr. FAIRBAIRN, F.R.S.
Dr. PERCY, F.R.S.
Dr. POLE, F.R.S.

Captain HARRISON, R.A., *Secretary.*

Mr. JOHN D. ELLIS examined.

671. (*Chairman.*) You are engaged at the Atlas Iron Works of Brown and Company?—Yes.

672. Were you present at Shoeburyness when the trial of the Gibraltar shield was made on the 19th of December last?—I was.

673. I believe you have had considerable experience at the Atlas Iron Works in the manufacture of plates for defences of that character?—I have.

674. Will you be good enough to give this Committee your opinion of the construction of the shield you saw fired at on the 19th of December?—My opinion of it is that it was mechanically badly constructed in several points, and that it was altogether, in quantity of material, much too light for the weight of the shot that were fired at it.

675. Will you state to the Committee what you consider was mechanically defective in the construction of that shield?—In the first place I consider it was faulty in being in laminated plates; but what more particularly struck me as being faulty was in the middle plate being in three pieces, and being exceedingly weak on each side of the port-hole.

676. Have you any opinion to express with reference to the form of the girders which supported the shield?—I think it was as bad as it could possibly be; it was a very bad form indeed of girder, because it was sure to be bent to a certain extent: that is to say, the inside of it was sure to be bent by the shot, and that would give an extension to the outside rib, which, from the manner in which it was made in rolling, it was sure not to stand.

677. You anticipated from that form of girder an easy fracture?—Yes; it was sure to break.

678. You have stated that in your opinion the quantity of iron used in the shield was insufficient for the purpose, will you be good enough to say what quantity of iron you think necessary in a shield to resist a shot from a 9-inch gun, with a charge of 43 lbs. of powder, at short ranges; and your grounds for recommending any given amount of iron for that purpose?—I do not think I could state that; but I should say that a 10-inch plate and a 5-inch plate would certainly resist perfectly well one or two shots close together; but, of course, if they were repeated several times close together even they must fail.

679. Do you refer to the Palliser shot?—Yes.

680. Have you seen many shots fired at plates of your manufacture with the Palliser projectile?—Yes; I have seen a good many at Shoeburyness.

681. And on board the "Excellent?"—On board the "Excellent" very few; they generally fire there with a 68-pounder.

682. Can you give the Committee any information as to the relative thickness of plate which is likely to resist a shot from a given gun?—No; I do not think I can.

683. You have stated that a 10-inch plate would be the thinnest face plate that you would propose to put on to a shield?—Certainly.

684. That being so, would there be any difficulty in making a plate of that size?—There would not be the slightest difficulty in making a plate 10 inches thick, and 4 feet, or 4 feet 6 inches in width, of any length up to 30 feet.

685. But with increased width would there be considerable difficulty?—There would, but with that width there would be no mechanical difficulty in rolling; but there is a difficulty in heating when you come to a greater thickness and width.

686. You think that the iron would not maintain an equally good quality with a thinner plate, if greater masses of iron were rolled into greater thicknesses, and at the same time of greater width?—Certainly; if it were a plate 8 feet wide and 15 inches thick, it would require moulds 24 inches high at least in the furnace; and it is absolutely impossible to ensure heating in the centre of a large quantity of iron like that, 8 feet wide and 24 inches deep, because you could not heat the centre without burning the corners off, and so far deteriorating it. You could not make, as we should term it commercially, a quantity of plates in that way.

687. (*Mr. Fairbairn.*) You mean that you would burn the outside edges before you got the required heat in the centre of the plate?—Yes.

688. (*Dr. Percy.*) That is to say, in such furnaces as you now use?—Yes; or any other furnaces that might be devised.

689. (*Mr. Fairbairn.*) Have you any idea of the difference between the resisting powers of a 10-inch plate as compared with two 5-inch plates?—I think that two 5 inch plates would offer about the same resistance as a 7½-inch plate.

690. As you were present during the experiments formerly made at Shoeburyness, I have no doubt you have paid attention to these matters, and from your experience in making these plates, it is your opinion that a 7½-inch plate would be equivalent to two 5-inch plates?—Yes; from the experiments which I have seen made.

691. (*Chairman.*) In making that statement do you look merely to the duration of two 5-inch iron plates as compared with a 7½-inch plate; or do you look also to the disintegration of the fabric which would be due to the breaking of the bolts?—I think that, letting alone the question of the bolts, and supposing them to hold, a 7½-inch plate would resist the same as two 5-inch plates. I find that when a sharp-pointed shot gets through a 5-inch plate, and begins to get through the second 5-inch plate, the second 5-inch plate begins to exfoliate, and we do not find that that is the case with a 10-inch plate.

692. Have you any information to give the

Committee with reference to the shearing action on the bolts which unite the several plates together?—There is no doubt that when bolts are put into holes quite tight, the shearing action, particularly when a shield is struck with a round shot which destroys the outside plate, is very great indeed, and it cuts the bolts through; but if the holes are tapered inside, so that they shall not bear on the edges, then the bolts do not suffer so much.

693. Have you any opinion to express as to the support to be derived from various kinds of backing, whether wood, iron, or stone?—I should say certainly that the harder the material of the back the better chance of the plate.

694. With reference to the fastenings?—With regard to the number of the bolt-holes, which of course are an evil, I think it would be well for the Committee, in contemplating the construction of forts, to consider whether it would not be very advisable to do away with nuts altogether; and, if two plates are to be screwed together, whether it would not be better to tap the back plate, and screw the bolt from the front plate into the back plate and have no nuts at all.

695. (*Mr. Fairbairn.*) You would require a very thick back plate to do that equivalent to the diameter of the screw?—Yes; certainly.

696. You might screw into an inch plate and then put a nut on after that?—I want to do away with nuts, because I think that they are a positive evil.

697. Were you present at the experiments which were made exclusively to ascertain what would be the effect of shot upon plates without any backing at all, the same as this shield is [pointing to a drawing]?—Yes; I did see them.

698. The jar of the blow caused the nuts to fly off?—Yes, in a regular shower, the same as it was with the shield.

699. (*Chairman.*) You wrote a letter to the Secretary, stating that certain plates made at the Atlas Works were to be fired at very shortly at Portsmouth?—Yes; the 8-inch plate is to be fired at to-day. I believe that the 10-inch plate has not yet been fired at.

700. You desire, I believe, to make some recommendation to the Committee?—I thought, as this very large plate was going to be fired at at Portsmouth, if the Committee thought that any information could be got out of that experiment, they might consider it worth while to go and see it. We have tried at Shoeburyness a 7-inch plate, and we have also tried two 5-inch plates together; we are repeatedly trying single 5-inch plates, and I thought it would be very valuable if we could ascertain exactly what a 10-inch plate would stand, under the same circumstances, because we do not know that at present.

701. Is the plate you have referred to the first 10-inch plate that you have made for experimental purposes?—I think it is the first that has been yet tried.

702. If you were to increase the width of the rollers, would you have any difficulty in exceeding that width?—Our rollers are 8 feet, and we have rolled a plate 6 feet 6 inches wide, 13½ inches thick, and weighing 26 tons.

703. It is with reference to the heating, is it not, and not the width of the rolls, that you hesitate to engage in making very wide 10-inch plates?—Yes, that is the only reason.

704. (*Mr. Fairbairn.*) Is there not always a great risk in a plate up to the thickness of 10 inches, of not getting the welds perfectly solid?—We have not found it so; we have made many 10-inch plates, and I believe they are perfectly solid; we have only made one 15-inch, and I believe it is perfectly solid also.

705. Do not you experience some difficulty, in the case of slabs placed one upon another, in getting them heated?—Not if they are narrow, but we do if they are very wide, and that bears exactly upon what I have said as to very wide plates, that we should burn the corners off before we got the middle part heated. On the other hand, if they are narrow, we keep the moulds apart with small pieces of iron, so that the fire gets into the mass, but if they were very wide, they would certainly shut up on the edges before the middle was hot.

706. (*Chairman.*) Will you be kind enough to define the word "mould?"—A mould is a slab of iron, a number of which we make into a plate in the last rolling.

707. (*Mr. Fairbairn.*) Can you roll plates which shall be perfectly sound to the extent of 15 inches thick?—Yes, there is no doubt of it.

708. (*Chairman.*) And of what width?—About 4 feet wide.

709. (*Mr. Fairbairn.*) 20 feet long?—Yes.

710. And of any length?—Yes.

711. (*Colonel Adye.*) Have you lately submitted to the Government any plan for iron shields for land defences?—Yes; we submitted a plan some time ago for Plymouth Fort; it was a plan of upright bars and plates between, but not for shields. We were asked to tender for shields, and we tendered according to the Government design, which was considerably heavier than the shield that was fired at.

712. (*Mr. Fairbairn.*) You did not offer any opinion upon it?—No, we did not consider it a good design at all, and we simply made an offer for it. Then, with regard to the Plymouth Fort, we offered an alternative plan which we considered was very much better, and of which I have a model, if the Committee desire to see it.

713. (*Colonel Adye.*) That is not merely for a shield to cover a gun?—No, it is for a fort at Plymouth; it is being made now by the Millwall Company. We proposed, instead of putting three thicknesses, to make it only in one thickness. The expense of it would be a little more for the same thickness.

714. You have stated that you are anxious to do away with bolts; are you aware of the experiments which were made some time since with what are called wood screws, according to the French system, and, if so, will you state your opinion of them?—I have never seen any experiments made with wood screws, although we make them for the French, but I have seen experiments made with bolts screwed into iron plates.

715. But these are bolts screwed into wood?—Yes.

716. You have not seen them experimented upon?—No.

717. Have you seen the absolute result of experiments which have been made by screwing bolts, as you suggest, into an iron backing?—Yes, I have.

718. Have they stood?—Yes, they have stood perfectly well, quite as well as with the nut.

719. Do they stand better than with the nut?—Yes, I think they do.

720. (*Mr. Fairbairn.*) In the case of the screws used in locomotive boilers we screw the stays; there is a double plate, an outside one, and

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D. a fire-box plate inside, and we screw them into both plates. Now, supposing that you have two 5-inch plates and that you put a sufficiently thick plate behind, would it not be better to screw into both plates without having any heads to the bolts?—Yes; I think that would come to about the same thing, only that you would be more liable to shear the bolts off. I should recommend that they should be quite loose at the junction of the plate, or else when a shot strikes the front plate and moves it if it is so tight as to be screwed right through both plates, the action would be to shear the bolt off.

721. Or else to crumple it up?—Yes, and I think that it should be loose. I think that the edges of both plates should be quite loose.

722. You would do away with the nuts?—Yes, and screw the whole into the back.

723. (*Colonel Adye.*) Have you made any experiments with bolts made of Acadian iron?—No, I have not; I have used much of the Acadian iron, and I have no doubt that it would make very good bolts; some Acadian iron is very soft.

724. (*Mr. Fairbairn.*) Have you made any experiments with steel bolts?—Yes, we have tried them as we try iron, and we have found that instead of lengthening they break short off.

725. (*Dr. Percy.*) What quality of steel did you try, was it homogeneous metal?—That means steel, and we have tried that, the softest possible homogeneous metal, and we have tried Bessemer's. We found that both of them broke short off; we have tried it with a sudden blow, and we do not ever find it to be equal to iron. We drop a ton weight from 30 feet upon them to bring them into tension suddenly, not on to the bolt, but on to a kind of strip to which we attach the bottom part of the bolt; we give it a sudden pull, and while the steel breaks off, the other would stand as much as four or five blows, and lengthen an inch and a half.

726. (*Colonel Adye.*) Do you think that 3 inches, which is about the size of the largest bolt now used, is a limit to the size, or would there be any advantage in having it larger than that?—When you get a bolt bigger than that, you must of course make the hole much bigger, and I think that what you would gain in one way you would lose in the other.

727. Are you aware that bolt-holes have not proved such a source of weakness as it was supposed by some persons they would?—Yes, I am; but that they are a source of weakness there is no doubt.

728. You would not advise that bolts should be used anything above 3 inches?—No; I think that is sufficient.

729. (*Mr. Fairbairn.*) Have you formed any opinion as to the relative thickness of a bolt compared with that of a plate; for example, if you had one armour-plate 5 inches thick, and another of 10 inches thick, what sized bolts should be used in the 5-inch plate, and what size in the 10-inch plate?—I do not think it would make any material difference. If you had two 5-inch plates put together, the strain on the bolts would not be really greater than it would be when you used a 10-inch plate, and the 10-inch plate is much less likely to yield: that is to say, I think that you want as strong a bolt for the one as for the other.

730. You are aware, no doubt, that there has always been an objection to perforating plates with bolts too large, because they weaken the plate?—Yes.

731. I believe you have not arrived at any fixed principle upon that point?—We have not. I think that in the experiments tried at Shoeburyness with two 5-inch plates, the bolts certainly stood better than the plates did, at the end of three shots the bolts had stood a great deal better in proportion than the plates had, which seemed to show that bolts of three inches were quite strong enough for them.

732. (*Colonel Adye.*) If you were asked to construct a shield against modern powerful guns, would you rely on a single plate, or do you consider backing absolutely necessary?—I think that I should be obliged to have recourse to backing, and to two plates, because I could not get one plate that was reliable to be large enough.

733. Then you would still act upon the principle of having plate behind plate?—Yes; because of the covering of the joint. You must have something to cover the joint, unless you have a plate large enough and thick enough in itself. If you put two plates along there [pointing to a drawing], then you have a joint, and you want to cover that somehow or other, or it will become a source of weakness. I think, therefore, that you want two thicknesses of plates, and I should have as thick a one in the front as I could get.

734. If you had two thicknesses, you would have a weak point, as in the Gibraltar shield: that is to say, where they crossed?—Yes: but I should propose to put two plates on the front of the shield for the whole length, in that way [describing], and at the back I should propose to cross them the other way.

735. As in the Gibraltar shield?—No; in that shield there are three widths in the second tier, and I would only have two there; then I think I should put another at the back, round the port-hole.

736. (*Mr. Fairbairn.*) Is it not a defective principle to have two plates, if you can get one plate made of equal thickness?—Yes; but I contend that you cannot roll a plate of sufficient thickness and size to be all in one piece.

737. You have already stated that you can do so?—Not of a sufficient thickness—8 feet by 12 feet, by 15 or 20 inches thick, I do not think can be done. When we put up our mill five years ago, large plates were what we went for, and we rolled a plate 6 feet 6 wide by 13 inches thick.

738. Does it not increase the weight so as to render it difficult to handle?—Yes; and it wastes very much. I believe that that plate lost three tons in the fire the last time when it was put in, by burning away; it took about 26 hours to heat it.

739. You could make plates 10 inches thick or 12 or 15 inches thick, 4 feet wide, and 18 or 20 feet long?—Yes, quite easily, and guarantee them; but you cannot make the shield in one plate. You must have two thicknesses, because the joint will want crossing.

740. Might you not put in a good backing behind of teak; for example, to take off the vibration of the blow from the shot?—I think I would rather not have any teak in it.

741. You could do it in two plates?—Yes, quite easily. I could put a 10-inch plate in the front, 4 feet wide and 12 feet long, and at the back I would put a plate 6 feet wide and 8 feet long; two plates of any thickness.

742. With a plate behind you would have to cross the joint?—Yes.

743. Would not a much thinner plate serve to

resist the action of the shot?—Yes; but I think it is scarcely my duty to speak of this. With regard to the strength of these shields, I suppose it will be for military men to give their opinions. I think myself that it will depend very much upon where they are put, because if you put them where ships can fire point-blank at them, you will want them tremendously strong; but if you put them at a great height, then you will be able to do with them a great deal lighter.

744. (*Dr. Pole.*) Do you still entertain the opinion that iron of the softest and toughest quality is the best material for plates?—Yes; I think there is no doubt of it; further experience leads to the conclusion that the harder we get it the worse the plates are.

745. As you increase the thickness you can ensure good welds?—Yes.

746. At the time the Iron Plate Committee made their report, they were not quite satisfied with the plates; they considered it an evil that the plates when they were struck by a shot laminated?—But we have considerably improved since that time in the manufacture of plates; the plates are now a great deal better welded. We have introduced the plan of placing pieces of iron between, and we find that the flame gets in better than it did, and that there is really no practical difficulty in the thickness, provided the plates are not too wide.

747. So that up to 8 or 10 inches you can ensure good welding?—Yes, perfectly so, as easily as in a 5-inch plate.

748. You have spoken of tapping the bolt into the hinder plate, but would it not be difficult in that case to renew the bolt?—Yes; you must drill it out.

749. Then you would probably use a nut after all?—Yes, or another bolt that was screwed.

750. (*Colonel Ward.*) With respect to the Gibraltar shield that you saw tried, there is a thin skin behind; do you think that the skin at all adds to the strength of the shield, or is it only required as a means for securing the girders?—That is all. As to the struts, I think that the resistance afforded is great.

751. Is it necessary to have a thin skin for that purpose?—I do not think so. I think it might be done without.

752. Could you not have a 5-inch plate behind and fasten the girders to it in the same way?—I think the girders might be fastened to a thick plate. I see no reason why the screws should not be screwed into the supports, nor why those supports should not be made of solid iron, and the screws screwed right into them.

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753. Do you say that you could not now make a plate 8 feet wide and 12 feet long by 13 inches thick?—I do not think we could, commercially speaking. We might make one or two, but I think we should not be able to get them sufficiently sound of that thickness and width.

754. (*Mr. Fairbairn.*) Could you make a plate 8 feet wide and 20 feet long and 6 inches thick in one piece?—I should think we might make it 6 inches thick.

755. If you got to 6 inches thick, you might go on to 8 inches or 10 inches thick?—Yes; but I think we should be a long while before we got to 15 inches thick, because the weight would be so enormous.

756. But you could get on very well with a 6-inch plate?—Yes, we could do that; but in a case of 40 tons weight, it is a very difficult operation.

757. (*Dr. Percy.*) It has been stated that the bolts which were used upon the first trial at Shoeburyness were defective in manufacture, and, consequently, deficient in strength, what is your opinion, or can you state whether those bolts were properly manufactured, so as to offer the necessary amount of resistance?—I think that they were made of very inferior iron.

758. Then it was not a question as to the manufacture?—No; it was the inferiority of the iron The iron was certainly of an inferior quality.

759. (*Chairman.*) Was it not soft enough for the purpose?—It was not good enough; it was poor iron in quality. I have with me a tracing of the fort that I have mentioned.

760 Is there anything further that you would like to state to the Committee?—I shall be very happy to leave with the Committee two tracings, showing the construction of the shields I have referred to, and one which we think will produce a better result. [The same were handed in and explained to the Committee.]

761. Does the cost of an iron plate increase very rapidly in proportion to its thickness?—Not very rapidly. A 7-inch plate would cost 30*l.* a ton, a 10-inch plate about 36*l.* per ton, and, I think, a 15-inch plate would cost about 42*l.* 10*s.* per ton.

762. What would be the market price of a 5-inch plate?—From 28*l.* to 29*l.* per ton, and up to 7 inches 30*l.* per ton.

(The witness withdrew.)

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763. (*Chairman.*) You have given a good deal of attention to the construction of shields for batteries?—Yes.

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764. Will you be kind enough to give the Committee any information which you have obtained in the course of your experiments. I believe you have constructed some shields?—I have made one shield.

765. Will you state, in the first place, what you consider to be generally the use of a shield?—I consider that the purpose of a shield is to defend the men and the guns in the casemate or battery; and the shield to which I have referred was one of the shields tested in the experimental casemate that was tried, I think, in 1865.

766. I believe you desire to explain to the Committee the principle which you have adopted in designing the construction of a shield for the purpose you have named?—Yes; I should like to do so as concisely as possible, I believe that a shield, in order to resist heavy shot moving at high velocities, requires *time* in which it is to do the work of stopping the shot, and this time can only be obtained, or can best be obtained, by increasing the depth of the structure. If a shield be only 12 inches in thickness, and that shield be fired at by shot moving at a velocity of 1,200 feet a second, it is quite clear that a 12-inch shield must do its work in the 1200th part of a second. If the same material, or the same weight of material be spread over a thickness of say 2 feet, then the shield will have exactly double the time in which to do its work. This, I consider, is an important element in the matter of resisting shot,

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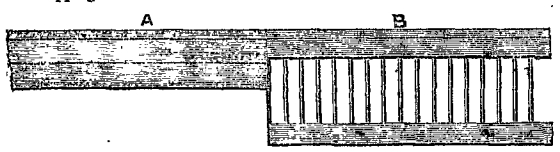
and combined with that is, in my opinion, to be had a dispersion of the work in the shot over a larger area at the back of the shield than when the shield is only 12 inches thick. In other words, I mean that in a 24-inch shield the area of the shield that will be affected in the rear will be greater than in the case of the 12-inch shield: that is to say, the work of the shield will in the latter be more likely to be confined to a small space. Now, combined with these principles, that of obtaining greater time and a larger resisting area, there is in a built-up structure, such as I have advocated for a long time, a certain amount of elasticity attainable; which elasticity will, in my opinion, have a beneficial effect upon the fastenings, and will tend materially to save them from being broken. The diagram, which I will now refer to, was made, chiefly, with a view to show the difference in time which these two modes of construction [pointing to the diagram] give to do the work of resisting shot. The shot travelling at the rate of 1,200 feet per second, traverses this space [pointing to the 12-inch diagram] in the 1200th part of a second, whereas it requires double that time to traverse the space here [pointing to the 24-inch diagram]. I have in the present case shown in both sections the same amount of material.

DIAGRAM illustrating the difference in "time," which the following arrangements of the same weight of iron, 480 lb. per foot, gives to the work of stopping shot.



Scale of 1½ inches = 1 foot.

A shot at the velocity of 1200 feet will traverse the space occupied by the plan A, in the $\frac{1}{1200}$th of a second, the time in which the iron must do its work. The plan B, has the $\frac{1}{600}$th of a second, or twice the time of plan A, to do its work in.

767. (*Mr. Fairbairn.*) I apprehend that what you want to show is that time is an element in the question, before the shot, after striking the plate, goes right through?—Yes; for example, a steam-engine of a certain power will do a certain amount of work within a given time; but if it be forced to do that work in a shorter time certain parts of the engine may break, because they may not be equal to the work. I say that there is sufficient iron in this shield [pointing to a drawing] to resist such projectiles as have penetrated the Gibraltar shield. This drawing represents a proposed improvement of these shields, using the same plates and supports. If I may be permitted to refer to a paper that I sent in I shall be able perhaps to make my statement a little more clear. [The paper was handed to the witness.] I have stated that in a structure the resisting power of which extends over a larger area, the elements of time and elasticity are both combined, as well as the element of radiation in the force of the impact. These, in my opinion, can be secured by separating the resisting parts of the structure into two portions, and connecting these by a compound backing, which compound backing in the present case is suitable to land works, where weight is of no great importance, or rather, I should say, is no objection; and I think it would be best composed of ribs of iron or steel, although I should prefer soft steel; in the cells or spaces between the ribs I propose to use a concrete, composed of broken cast-iron and asphalte, or marine glue, or any similar substance that would be most suitable.

768. Have you ever tried this mode of construction?—I have not, but I believe that an asphalte similar to that which is used for the pavements in Paris and in our own City, would be a good filling combined with pieces of broken cast-iron of about the size I contemplate; about the size of road-metal—the broken stones used for Macadamized roads. The advantages of a backing of this description I would sum up somewhat in the following manner:—First, I consider that its chief advantage is that it gives the material *time* in which to do the work; and the element of time, in my opinion, is of importance, because, secondly, it affords to the adjacent parts of the structure, or the parts adjacent to the point of impact, *opportunity* to come to the assistance of the point attacked. Besides these elements of resistance, there is in a structure of this description a certain re-active force; for a plate when resting upon such a backing as I have ventured to describe, will yield a little before it be penetrated; and, however little it may be, yet that little will, I think, tend, in some degree, to absorb or lessen the velocity of the projectile. Another important point connected with a backing of this description was originally pointed out by the Iron Plate Committee upon the first trial of the Chalmers target. The laminæ of the iron at the back being supported by a series of steel or iron ribs, will so act upon the shot as to absorb in a great measure its remaining velocity as it passes through the plate so that the backing itself will have a considerable *brake-action* upon the shot. If, for instance, the point of a Palliser shot enter opposite one of the edge-plates, the shot will be deflected off to one side, in consequence of the ogival head of the shot impinging on the edge-plate, the result of which will be that a jamming action will take place as the shot passes through the plate. I may mention to the Committee that this principle was beautifully illustrated at a trial of a target with a similar backing, at Vincennes, when a shot struck fairly between the two ribs; meeting, as it were, the resistance of both, it failed to penetrate or enter the plate, and when it struck fairly opposite the edge of one rib, the same shot with the same charge entered, but was turned or deflected so much to one side that it was jammed at an angle of about 45° in the plate. This experiment shows that it would be advantageous to have the edge-plates closer than in the Vincennes target (they were $6\frac{5}{8}$ inches from centre to centre); they should at least be as close as in the Chalmers target—5 inches from centre to centre.

769. What kind of shot were fired at that target?—The shot fired at the Vincennes target were 9-inch, or what is termed 300-pounder, steel shot with ogival heads of one diameter.

770. (*Mr. Fairbairn.*) Of what thickness was the plate?—The plate was $5\frac{1}{2}$ inches thick, which is exactly the thickness of the plate here [pointing to the diagram of the Gibraltar shield]. As I have said, the backing itself will have a brake-action independently of the jamming of the shot, because it is proposed to use the edge-plates so close together that a shot that would have the power of penetrating the outer or front plate, will not pass through between them without jamming to a certain extent. In my opinion, this would so reduce the velocity of a shot (that would penetrate a similar weight of material, arranged as in the Gibraltar shield) before it reached the second plate, that it would not have power to penetrate it, and it is likely that the material of the shot would stick in the backing; and by its inertia tend

to prevent penetration by a second shot that might strike the same place.

771. (*Chairman.*) What would you say in the case of shell?—I think that shell would be very much confined in a structure like this, especially a shell that had only 3 lbs. or 4 lbs. of bursting charge. Another point to which I have given some attention is, that I believe a backing of this description with some elasticity, such as I have described, would prevent the shield from being moved out of its position; the backing is calculated to receive a certain amount of the damage that is effected by the shot, and the force of the impact would go to penetrate the outer plate, and to crush the backing on one side instead of moving the target bodily away, as in cases where the intention is to resist the shot at the point of impact. The fastenings that keep the shield in position would only have to withstand a shock sufficient to penetrate the front plate—say 2,000 foot-tons, the remaining work being gradually absorbed in the backing. But when the front plate is supported with the view of resisting the shot at the point of impact, the entire work in the projectile (less what the inertia of the shield itself may overcome), will be expended in destroying the ground fastenings, and in moving the shield from its position. I have also given some attention to another feature to which I should be glad to call the attention of the Committee, one as to which, in my opinion, there is at present a very great popular mistake prevailing, and that is in regard to the resistance or security offered by thick solid plates. I need not before this Committee say more than a word of the two experiments that we have made in this country with very thick plates, the 11-inch plate that was made for the Russian Government by Brown and Company, and the 13½-inch shield that was tried alongside of my own in the granite casemate at Shoeburyness.

772. (*Dr. Pole.*) Have the goodness to tell the Committee all you know about those experiments?—The 11-inch plate that was manufactured by Brown and Company, and intended for the Russian Government, was destroyed by a single shot from a 13¼-inch gun with a charge of 90 lbs. of powder, representing 5,900 foot tons of work.

773. This was, I think, one of the experiments made by the Special Committee on iron. Was not the range 200 yards?—The experiment was conducted by the Iron Plate Committee, and, I think, the range was 200 yards. The plate was unbacked, and the object of the trial was, I believe, to ascertain what 11-inch unbacked plates would do in resisting heavy projectiles, with a view to their being used as shields for embrasures.

774. Was this before the trial of the casemate?—It was a year, I think, before the casemate trial took place, but I do not recollect the date exactly. My object in mentioning that, as well as the case of the 13½-inch shield, was for the purpose of showing "that destruction does not come merely from penetration," because the 11-inch Russian plate, though it was not penetrated, was split from end to end like a lath, and the two halves, torn from the fastenings, were thrown 6 feet apart; had it protected an embrasure, the whole work would have been exposed.

775. And that was done by one blow only?—Yes, by one shot only. The plate resisted penetration, so that the shot did not go through; it bounded back 14 feet, after driving one half of the plate in one direction and the other half in another direction.

776. What was the area of the 13½-inch plate?—It was 8 feet long by 6 feet wide, with a port-hole of 3 feet 8 inches by 2 feet 4 inches, cut out of the centre of the plate. This plate was broken clean through on one side of the port-hole by a blow from the 9·22-inch gun with a charge of 30 lbs. of powder and a steel shot. I may mention that another difficulty with regard to thick plates, independently of penetration, is the difficulty of fastening these plates. If they are bolted to the skin, and strutts are used similar to those in the Gibraltar shield, the fastenings and supports would be to the plate itself somewhat as the hinges and bolts of an ordinary door are to the door—I mean a good fair strong door which, if attacked, would give way as a general rule at the hinges and bolts before the door would be broken in, and these back supports being so much lighter than the plate itself, would, in all probability, be served as the girders in the Gibraltar shield were: that is to say, they would be broken by the force of the blow, and be driven to the rear. Take, for example, a wall made of planks, plastered on one side; if you were to strike the wall with a sledge hammer, or with a mallet, on the other side, you would not seriously injure the wall upon the side struck, but you would drive all the plaster off the other side of the wall, and so will the light iron which is attached to the back of a solid thick plate be broken, and driven to the rear as the H girders were in the Gibraltar shield. With improved gun-carriages, there is doubtless a possibility of reducing the size of the port-hole or embrasure in a thick iron shield, which the advocates of thick plates aver will be greatly in their favour; but I maintain that a small port-hole will be equally in favour of a strong built up shield, such as I have recommended. There is one point more to which I should like to call the attention of the Committee, and it is an interesting one. The 7-inch Woolwich gun, with a charge of 16 lbs. of powder, sends a 7-inch Palliser shot right through a 7-inch unbacked plate at, I believe, 200 yards. I do not know that the 9-inch gun has ever been tried against a 9-inch plate unbacked, but I presume that it would have the same effect that the 7-inch gun has upon a 7-inch plate, and also that the 12-inch 25-ton gun would equally master a 12-inch solid plate. In my opinion, the plates will not improve in quality as they increase in thickness, so that a 12-inch plate would be no more to a 12-inch gun than a 7-inch plate is to a 7-inch gun. I conclude, therefore, if thick plates be the sole defence, that it would require a solid plate of at least 13 inches thick to resist a 12-inch gun: that is, to resist penetration merely, but, as I have already mentioned, the trial of the 13½-inch shield in the granite casemate shows clearly that destructive effects as damaging as penetration come in another form.

777. You mean by cracking the plates?—Yes; I am of opinion that two plates, each of them being 12 feet by 4 feet, and 15 inches thick, applicable for a shield, would be broken in two, and probably driven into the casemate, by four rounds from either the 12-inch rifled gun, or the 15-inch Rodman gun, with from 5,000 to 7,000 foot tons of work in the shot, if the shot struck within a radius of 4 feet from the centre of the port-hole.

778. (*Chairman.*) But that could be effected only by very exceptional charges, 90 lbs. in the one case and 100 lbs. in the other?—I take 70 lbs. as the charge in both cases. These, gentlemen, are something like the views that I wished

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to submit to the Committee, and if there are any questions that you would like to put to me, I shall be very happy to answer them.

779. (*Mr. Fairbairn.*) Your present suggestion is founded upon your original principle of having a compound backing, but you now propose to use broken cast-iron, and to fill up the interstices with concrete as solidly as you possibly can?—Yes, for land defences.

780. Has it occurred to you that if instead of doing what you have suggested, which would make it very little better than concrete and stone, except that these pieces [pointing to the diagram] would be harder, you were to make it of cast-iron, entirely solid, and like an anvil, it would be better than concrete and cast-iron?—That would do away with one of the principles which I consider so valuable in resisting shot, and that is the elasticity of the backing—its operation as a brake-action bringing the shot up by degrees.

781. But there is not much elasticity in the material which you propose to use, or as you would have in wood?—No; but these broken pieces that I propose to use would be dispersed by the point of any shot that entered, so that they would be pushed on one side, and as the shot pushed them aside, they would absorb the work in the projectile until, when it reached the second plate, its velocity would be so low that I do not think it would penetrate the second plate, I mean such a shot as would penetrate a structure of this description [pointing to the diagram of the Gibraltar shield].

782. After the first impact of the shot, these pieces [pointing to the improved diagram] would remain, and there would be no elasticity or power to spring back, and the shot would do still more damage. If so, do you think that your plan would be better than a wooden backing?—I am in favour of wood in the backing, and would not give up a compound backing, composed of wood and iron, for the one now proposed; but the objection to using timber in what are termed permanent structures is, "that the wood may decay or prove unserviceable at the very moment when it may be required," and therefore I submitted the backing now suggested, which would be as durable as the rest of the material of which the shield is composed. If it were possible to fill these cells [pointing to the diagram] with solid cast-iron, then we should be attempting to resist the shot at the point of impact, and so far should be causing the destruction that would otherwise expend itself, or use itself up in the backing, to fall upon the fastenings in the rear.

783. It would resolve itself, would it not, into the plate being hammered as upon an anvil as nearly as possible, and you might hammer for a long time before you penetrated it?—Yes; I grant that it would resist penetration, but destruction from disintegration would be more certain in consequence of the greater rigidity. I would also respectfully call the attention of the Committee to a suggestion, pointed out in this drawing, if it has not been already offered. The Committee will observe in the diagram the space in the rear of the target between the port-hole and the strutt, and which does not interfere at all with the training of the guns.

784. (*Chairman.*) That is where the men would be?—I think that the men would, in the case of shields like those which have been lately tried, endeavour to get a little further to the rear, but still there would be room for several men in that space. This cushion of timber [pointing to the diagram], occupying the space between the upper and lower sets of H-girders in rear of the target, would be a means of preventing pieces of iron that might be broken off from flying about, as in the case of the Gibraltar shield, and the through bolts of the shield might go through this supplemental wood backing, and tend very much to secure them from breaking.

785. (*Mr. Fairbairn.*) Do you contemplate the shot going right through at the same time?—I believe that the improved shield would resist a 12-inch shot with 70 lbs. of powder; but I am quite of opinion that a 12-inch shot with 70 lbs. of powder would penetrate the first and second plates, and probably bulge to some extent the inner skin.

786. Supposing that good oak or good teak, which does not decay, was used, and was kept dry, and suppose that it lasted for 200 years, might you not substitute that in the place of what you propose?—Yes, certainly.

787. Would you not make a more perfect and a more powerfully resisting shield if timber were filled in here [pointing to the diagram] on the principle of your first target, than to fill up these spaces with broken cast-iron and asphalte?—I have already stated that I should prefer a compound backing of alternate layers of steel or iron plates and timber to this [pointing to the diagram], but I was not willing to risk my suggestion before the War Department as I did before, and have it thrown out on the ground that it was not admissible, on account of the perishable nature of the material.

788. (*Dr. Percy.*) Have you had any experience to justify your preference for steel for the purpose mentioned?—No; only that the same section of steel is generally allowed to have greater strength than iron.

789. (*Mr. Fairbairn.*) Would you not put any more stays in here [pointing to the diagram]?—In my letter I have suggested that this portion—the supplemental backing [pointing to the diagram], might have ribs of iron.

790. (*Chairman.*) You have not carried this out except upon paper at present?—No.

791. (*Mr. Fairbairn.*) The vertical ribs, as shown in this diagram, would give very great support to the cells, and if the cells were filled up with something elastic, that would bear the blow at the same time, would not that be an advantage?—I may say that I have no preference for this backing, and I may mention that the shield which was tested in the granite casemate had a backing composed entirely of iron instead of alternate layers of timber and iron, as I originally proposed, and I believe that the fastenings of that shield suffered on account of its too great rigidity; the elasticity was completely destroyed on account of its being composed entirely of iron instead of alternate layers of timber and iron. I am of opinion that this backing, with broken pieces of iron, such as I have suggested, of an irregular shape, the interstices being filled with a soft, sticky substance, such as marine glue, or indiarubber glue, or asphalte, would have sufficient elasticity.

792. (*Chairman*). Would you prefer such materials to wood, if you were allowed to use them?—I say that I should prefer wood, if I were allowed to use it.

793. (*Dr. Pole.*) Would you put wood in those targets between the edge-pieces?—Yes, in preference even to the other kind of backing.

794. (*Chairman.*) Could you supply the Committee with the official records of the French experiments made at Vincennes?—I cannot; but there were reports made; they are here, I believe, and can be got. I may add that the target on my plan was not made by me, nor under my inspection, and that the edge-plates were placed wider apart than I recommended.

795. (*Dr. Percy.*) Were you present at those experiments?—Yes; and Colonel Younghusband, who was present, sent a report to the War Department, and Captain Hore sent a report to the Admiralty.

796. (*Mr. Fairbairn.*) This [pointing to the diagram] is a 5½-inch plate [the front plate], and supposing you took 2 inches or 2½ inches off this plate [the second plate], and put it on to that, and reduced this [the second plate] to 3 inches, adhering to the same system, would not that make a better target?—I certainly think so.

797. Is there any serious objection to that?—I have none. I should prefer it. I prefer having more in front and less here [pointing to the diagram], but I wish to state distinctly that this drawing is based on the present Gibraltar shield, that it is a proposition to improve these shields, and to use the same materials.

798. (*Chairman.*) Will you state to the Committee whether you are prepared to bring forward a shield on a plan of your own, showing the best principle that you can adopt for offering resistance to shot fired from modern improved artillery, and with an estimate?—I will do that with pleasure.

799. Can you state to the Committee what the estimated cost per shield would be of inserting these materials in the form you have suggested?—The estimated cost of this alteration [pointing to the diagram] as an improvement upon the Gibraltar shield, irrespective of the supplemental timber backing, which is merely a suggestion, is from 130*l.* to 150*l.* per shield.

800. Including the insertion of the cushion?—Yes.

801. (*Mr. Fairbairn.*) Supposing you filled it with wood instead of broken cast-iron. I suppose that would not be so expensive?—It would be perhaps 30*l.* or 40*l.* per shield less.

802. (*Dr. Pole.*) Do you mean that the shields already made could be altered for that sum?—Yes. I do not know that I have made it clear enough in my letter, but these dotted lines [pointing to the diagram] show exactly the size of the present plates, and all that would be necessary to give the gun the same training would be to cut these corners off for a part of the length of the port-hole, and it would require longer bolts. I sent a sketch of the bolt which I proposed to the War Department, along with the drawing that I see on the table before me. I have offered as a suggestion to the War Department and the Committee a bolt which I consider will have a very great stretching range before it breaks.

803. (*Chairman.*) Has it ever been tried?—No, it has not. In this bolt one of the first features is the shallow thread, devised to save as much of the section of the bolt as possible. The thread now proposed is the same as that which was originally used in the bolts of the Chalmers' target, not a single bolt of which gave way up to the 22nd round, and when, at the subsequent trials, two or three bolts were broken, in no case was any of those bolts broken at the thread. The bolt now proposed would be a very simple bolt to make, and cheap; it is composed of two half-round bars of iron, with a piece welded between them for the head, and a thin piece of about half an inch thick welded for the point, leaving a slot, or opening, from nearly the bottom of the screw up to the commencement of the cone. This slot, or opening, I propose should be filled in with a piece of timber merely to fill it flush. The chief advantage of reducing the shank of the bolt in this way, is that the bolt entirely fills the hole, and the main advantages of the bolt itself are that the thread will strip a little or altogether, rather than snap the bolt, and owing to the peculiar method of making the bolt, there will be a considerable stretching range.

804. Would there be any advantage from stripping the thread, or would not the bolt lose its hold if the thread was stripped equally as if the bolt was broken?—Not so much, because it may strip the thread, and still have a good hold. I believe that in a bolt of this kind, these two pieces [describing] would be drawn together, and that, in combination with a good-sized elastic washer, would, I think, make a very strong bolt, and one that would be less liable to snap than those which are in general use, or than a Palliser bolt. I think the chief advantage of the Palliser bolt is the shallow thread, and that is the great advantage in this bolt. The shallow thread, I believe, was first used at Shoeburyness in the bolts of the Chalmers target.

805. (*Colonel Adye.*) Your general view is, as I understand you, that mere iron plates without support will never be sufficient?—Yes.

806. Therefore you must have a backing?—Yes.

807. Do you see any material difficulty in constructing a shield with a wood backing which could be replaced at the end of a few years, supposing that it perished, by unscrewing the bolts, and taking the shield to pieces, and putting in others?—I think it would not be either expensive or difficult. A shield could be so made that it would be a comparatively easy process to replace the timber.

808. Therefore there would be, in your opinion, no particular objection to employing a wood backing for land defences?—Not in my opinion.

809. You are aware that, in your proposal to use concrete, you lose the elastic backing which was one feature of your target?—That I am aware of to some extent, and I propose, if wood is not admissible, to use something elastic, for the filling in of this concrete, such as India-rubber glue or marine glue, it will have a certain amount of elasticity even when cold.

810. Do not you think that bolts are more likely to go with such a backing as that than with a wood backing?—I think they would be more likely to go with this backing than with a wood backing, but I do not know that there would be any very great difference in that respect.

811. You have stated that you consider your proposed backing is useful, because, from its depth it gives more time for the operation of resisting the shot?—Yes.

812. Do not you think that your backing is chiefly useful, as giving support to the front plate from the stringers being end on?—Yes; that is the great feature of the backing; that, in a word, it brings the back plate up to the support of the front plate at the moment of impact.

813. Therefore the strength of your backing does not lie so much in the matter of time as in the fact that you have end-on stringers to support

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the front plate, as when you build a floor you put the rafters end on, and you put the floor upon them?—Yes; but along with the question of time there is the very important question of absorbing the velocity of the shot.

814. I think that the great strength of your target lies in the end-on stringers supporting the front plate without regard to time, and that is the same principle upon which you would build a floor, you get the strength of the rafters by placing them end on?—Yes, it is the principle of the beam.

815. If you were asked to construct a shield to be opposed to the most powerful guns of the present day, as I understand you, you would have a front plate equal in thickness at least to the calibre of the gun that was to be fired at it?—I think I would hardly go so far as that. I would not ask for such a thickness; with the backing that I propose I should be satisfied with less thickness.

816. You would have a thicker front plate than before, would you not?—Yes.

817. Do you see any objection, supposing that wood was not admissible to laying the stringers end on, all of a row, in close contact with each other, and having the whole backing of stringers?—Yes; I should decidedly object to that, because that would be adopting exactly the principle of the shield that was tried in the granite casemate in 1865, and which showed, in my opinion, that one source of its weakness was that it was too rigid, and brought destruction upon the fastenings.

818. Are you aware that upon the second trial of the Gibraltar shield, which was perfectly rigid, by an alteration of the bolts that difficulty was to a great extent overcome, and that then the bolts did not so much give way?—I am aware that the bolts did not give way so much upon the second trial, but the character of the shield was altered from being a perfectly rigid structure, in consequence of the adoption of very thick elastic washers, which thick elastic washers may be said, instead of being washers, to have formed part of the shield, or to have taken the place of the backing.

819. But if you had these end-on stringers in close contact with each other, and you used thick elastic washers, you would at all events make a strong target, and obviate the difficulty as to the bolts, and also the objection to employing wood in the centre; in other words, I mean that you might make a rigid structure with bolts and elastic washers that would stand?—I should, if it were insisted upon that the backing should be entirely of iron, always prefer to leave an opening between the pieces, and this would give me at least elasticity in one direction, so that when a shot entered among these pieces, they would be dispersed, or pushed on one side. I am in favour of receiving in the shield or target a certain amount of the work.

820. Do you not perceive that the advantage of having a continuous line of end-on stringers would be that you would be sure to have one opposed to the shot when it struck, whereas by your plan you might have an empty cell opposed to the shot?—Yes; but in the proposition which I am now submitting the stringers are so close together that no shot which could penetrate the outside plate, would pass between them; they are 5 inches from centre to centre.

821. (*Dr. Pole.*) Does your experience lead you to concur in this principle, that seeing that a shot contains a certain quantity of work which must be destroyed or absorbed in some manner, before the shot comes to rest, it is more expedient to make such arrangements as will absorb that work than to attempt by simple hardness and thickness to resist it altogether?—That is precisely the result to which my experience has led me in considering these matters.

822. Therefore, any arrangement of a target which will admit of an absorption within itself of that work, will be better than attempting to interpose an anvil, or anything analogous to it, with a view to resisting the shot without absorbing the blow?—That is exactly my opinion, and that is what I have endeavoured to carry out in my plan. I have not submitted in connection with these matters anything that had for its object to resist shot at the point of impact, but to absorb the work of a heavy projectile before it was capable of passing through the whole structure. And that is one of the reasons why I should object in some measure to a very thick front plate. I should like just such an outer plate as will be sufficient to break in pieces the heaviest shot that was likely to be brought against it, so that the pieces would be scattered or compressed, and the work in them absorbed in passing through the backing.

823. (*Colonel Adye.*) Supposing that your backing were adopted just according to your own views, do you mean to say that you would prefer a 6-inch plate instead of a 10-inch plate in front?—Yes; and put the rest of the iron in the second plate.

824. I meant everything being arranged, except the front plate, then would you not have a thick plate in preference to a thin one?—Yes, I decidedly would; but that is a different question. I wish to add this paper to my evidence: "In regard to the resistance of thick plates, the failures of the 11-inch Russian plate, and the 13½-inch shield are valuable as data. Then, with regard to the fastenings of thick plates, if bolted to a skin supported by strutts, as at present, the rear attachments, which now bear about the same relation or proportion to the shield as the hinges and bolts bear to an ordinary door, will be unequal to the work of supporting the plates. If there be no cushion between the plate and its rear supports, the latter will be broken opposite the point struck, and driven to the rear, as in the case of the H-girders of the Gibraltar shield when struck by the Rodman shot. The effect on the rear supports and fastenings would be like to that on a wall of timber planking plastered on one side when struck a blow on the opposite side. Though it would not seriously damage the planking itself, the plaster would be broken, and driven away from the wall. If the work of a shot were to develop itself in penetration *only*, perhaps thick plates would be the best defence. But the only two instances in which thick plates were tried at Shoeburyness, destructive effects, as fatal as penetration, came in other forms, one plate 11 inches was split from end to end like a lath of wood, and the other 13½ inches was broken clean across by a few light projectiles with reduced charges. Thick plates with large openings, through which to train the guns, will be more easily broken and torn from their fastenings than built-up shields. If a port-hole of reduced size would add to the strength of a solid thick plate, it would do the same to a built-up shield. As it will be difficult, if not impracticable, to find a backing that would support very thick plates, so as to prevent buckling or bending, the plate itself will be the sole means of resistance. Bending, in the case of

plates of moderate thickness, does not imply destruction, as the fibre on the convex side will stretch sufficiently in most cases, and thus the plate will remain unbroken. For instance, a 4-inch plate may receive a blow, the effects of which, or bend, will extend over a radius of, say 12 inches from the point of impact, and produce such a curvature at the back as will require the fibres to stretch one inch; but a similar bend in a plate 12 inches thick would require the fibres, on the convex side, to stretch 3 inches, which is more than sufficient to rupture the plate. I am supposing such effects to be produced by a similar blow, as they doubtless would be if the 4-inch plate had a backing equivalent to the extra 8 inches of iron in the thick plate. I am not now referring to the effects of a shot like the Palliser, the work of which goes chiefly into penetration, but to the blow of a shot like the Rodman. Still I am of opinion that the same weight of iron, as in a 12-inch solid plate, if judiciously arranged in a built-up shield, 24 *inches thick*, would give better resistance to both classes of projectiles than a 12-inch solid plate. If the 7-inch gun, with 16 lb. charges can penetrate an unbacked 7-inch solid plate, the 12-inch gun with 70 lb. charges would do the same to a 12-inch plate. Hence it would require a 13-inch plate, at least, to resist penetration by the 12-inch gun. But though such a plate could resist *penetration* by this gun, the trial of the 13½-inch shield, in the granite casemate, shows that destruction equally fatal may be effected in another shape by much lighter ordnance; for this shield was broken clean across one side by a blow from the 9·22-inch gun, with only 2,662 foot-tons of work. If shields or plates 13½ inches thick thus go down before a few rounds, with from 2,500 to 3,000 foot-tons of work, it seems quite clear that 15-inch plates, or even 18-inch plates, would soon be disposed of by shot from the 12-inch rifled gun, or the 15-inch Rodman, with work on impact of from 5,000 to 7,000 foot tons. I am of opinion that two plates, each 12 feet by 4 feet, and 15 inches thick, arranged for a shield as under, would be broken in two and driven into the casemate by four rounds from either of the above guns with 70 lb. charges, if the shot were to strike within a radius of 4 feet from the centre of the port-hole.

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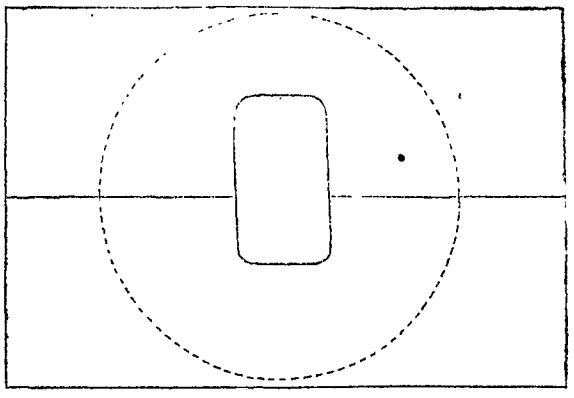

The plates alone of such a shield would probably cost from 1,000*l.* to 1,200*l.* If, then, a heavy shot cannot be resisted successfully, or economically, by mere thickness of plate, I respectfully submit that it can be *so resisted* by thinner plates, in a built-up shield, with a good compound backing."

(The witness withdrew.)

Adjourned till Wednesday next, at 2 o'clock.

Wednesday, January 8th, 1868.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Chair.*

Major-General Sir WILLIAM GORDON, K.C.B., R.E.	Mr. FAIRBAIRN, F.R.S.
Colonel ADYE, C.B., R.A.	Dr. PERCY, F.R.S.
Lieutenant-Colonel WARD, R.E.	Dr. POLE, F.R.S.

Captain HARRISON, R.A., *Secretary.*

Mr. CHARLES WILLIAM LANCASTER examined.

825. (*Chairman.*) This Committee has been appointed to inquire into certain facts with regard to the shield known as the Malta and Gibraltar shield. How far the trials which have been made were unfavourable to the shield, what were the causes which led to any failure in the shield, and what changes in the construction of such shields the Committee would recommend. The Committee desired to have your opinion, and, first, I will ask you whether you were present at the first trial that was made of the shield at Shoeburyness on the 25th of October?—I believe that upon that occasion there were only two shots fired at the shield. I was not present at the trial, and I believe there were no spectators.

826. When did you first see the shield?—On the occasion of its last trial, when I believe the Iron Shields Committee were present.

827. That is to say, after the shield had been re-bolted and set up?—Yes.

828. Did you examine the structure of that shield?—Yes.

829. You have had considerable experience as to the resisting power of various fabrics of iron?—Yes, very great experience.

830. Have you any opinion to express to the Committee as to the character and fitness of the shield referred to for the purpose intended?—I think it is a matter of regret that the structure did not embrace a more thorough strengthening and support of the centre parts of it. I think it is also a matter of regret that there was not on the

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top of the shield what is called a "top" plate, which are used in other targets. There is also employed in other targets a sole plate and a top plate, which perform a most important duty, and you are thereby enabled to dispense with a large number of the bolts, and adds very largely to the rigidity of the target. So far as the general design of the shield is concerned, I must express the opinion, with all due respect to this Committee, that it should have comprised, not merely a base plate represented by so much armour-plating, and the struts at the side and the form of the base, but I think it is thoroughly provable, that had the design embraced a top and a bottom and a side, you would have had a far more complete design than you now have, I will endeavour to illustrate what I mean [describing to the Committee on paper]. If the Committee will allow me to explain my views for a moment, I think they will be able to see what I desire to have a shield like. I take the same area of front wall, which is armour-plate, with a port-hole in it, and then, instead of having struts, you take the radius you require your gun to describe, and make a floor of iron, the sides being composed of armour-plate, and having a top to it equivalent in area to the base you have laid down [pointing to a diagram]. You would thus have a complete iron fortification for one gun, and the advantage it presents is this, that this side [pointing to a sketch] becomes an enormous element of strength, because you can strut it in this way [describing] in every portion of the target, and you do not depend upon the same number of bolts that you do in the other case. You have the complete resistance of the arch that you throw across in the form of a strut when it is attacked by artillery. Now, supposing the armour-plate is 10 inches or 12 inches or 15 inches thick on first design, and supposing that the attacking artillerist says to himself, "I am aware of the construction of the embrasure before me, and I know that it will be a very difficult matter to destroy the face of this structure. I will therefore simply just attack the stone-work underneath it, or above it, and tumble the embrasure out." Whereas, if you had this [pointing to the sketch], with a sufficient base which embraced the whole detail of the gun with a roof, making it a complete iron house, as I should propose, then the superincumbent stone-work, if it were in a fortification built of stone, or if it were in earthwork, the superincumbent earthwork or sand, this iron house would remain *per se* an iron fortification, containing and protecting the men and gun. Assuming the front to be of stone, and the earth is disturbed at the side or underneath this [pointing to the sketch] would remain intact. I may say, as an example, that I would not build a house with one front wall. I would have a back wall and side walls, so as to make a complete structure of it. Omitting the back wall here [pointing to the sketch], these sides and the roof form part and parcel of the plan. You would have no back here [pointing to the sketch], but you would have a plan of iron, a roof of iron and a side of iron, and you would have strengthening beams from side to side and from top to bottom.

831. (*Mr. Fairbairn.*) Would you protect the sides here [pointing to the sketch]?—Yes. Supposing it were at Gibraltar or Malta, it would be stone-work; but if you had to erect earthworks with iron embrasures, which would be a very economical plan, all between one embrasure and another would be filled in with sand or earthwork; but I think it ought to be held as an axiom in the construction of embrasures of iron, that it should be perfect *per se*, and independent of everything else, because if all the weaker materials which are more liable to be destroyed by artillery were knocked out, the men would be protected by the roof and sides of the iron house.

832. Will you describe the armour-plates?—These [pointing to the sketch] would not be so thick, and these beams would be stepped in, so that you would not have to depend upon the bolt-heads.

833. (*Chairman.*) I understand, from what you have described, that you do not conceive that an iron embrasure ought to have any reference to the strength or thickness of the connecting parapet?—Certainly not. I presume you are not referring to an embrasure in an entirely iron fortification?

834. No; merely to an iron embrasure with reference to the question before the Committee?—Quite so; and I am of opinion that it ought to be complete in itself for the protection of the gun and the detail of men.

835. With reference to the special shield which you have seen, are you satisfied with the mode in which the shield is constructed?—As far as my opinion is concerned, I believe it would have been far preferable to have had a different construction, in which you would have had one solid plate instead of two.

836. Are you of opinion, looking to what is required to resist Palliser shot fired from the 9-inch muzzle-loading gun, at a range of 400 yards, that there is a sufficient mass of iron, irrespectively of the form, in the front of that shield?—Decidedly not.

837. Can you state to the Committee what quantity of iron you consider would be sufficient to resist one or two impacts of shot fired from the 9-inch gun at short ranges?—At short ranges, and I will suppose the efficient range of the rifled gun to be 200 yards, I do not think that there ought to be a less total thickness than 14 inches of iron.

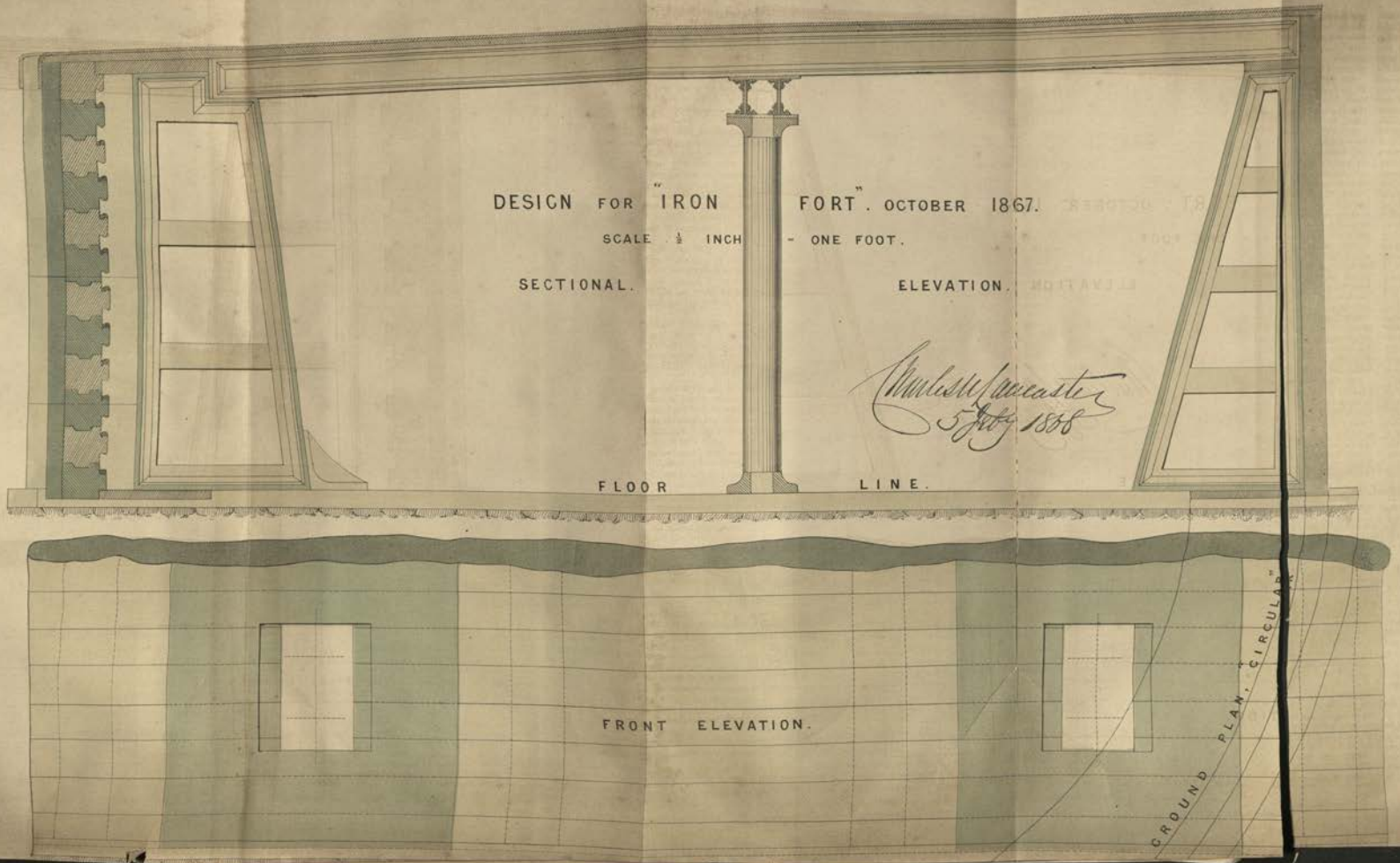
838. Backed or unbacked?—Unbacked.

839. Do you mean that you would employ one 14-inch plate?—I mean this. Supposing you had a 12-inch plate in front, whether you had hollow stringers or not, which I consider is a very excellent plan, and a 2-inch plate at the back, combined with girders, I think there should not be less than 14 inches of iron, assuming, not merely the 9-inch gun to be used, but any of the guns that are in use at the present time.

840. You are of opinion that the front plate ought to be at least 12 inches in thickness, and that the backing had better be a backing of iron than of any other substance?—I believe that for permanent fortifications the use of wood cannot be relied upon, because our empire is so wide and extensive, it embraces so many parts of the world, and all varieties of climate, where such structures would be exposed to the attacks of insects. I, therefore, do not think it would be wise to employ a composite backing of iron and of wood for permanent fortifications, and in that respect I think that the Royal Engineers have exercised great discretion; in fact, I believe firmly that there would be no difficulty, by making a few experiments, in showing conclusively that it is perfectly possible to have a structure made entirely of iron, free from all wood, and yet thoroughly reliable, even when opposed to the heaviest artillery.

841. (*Mr. Fairbairn*) Do you anticipate any difficulty as to the fastenings?—No; I think not.

842. Not from the vibration, when a shot strikes?


DESIGN FOR "IRON FORT". OCTOBER 1867.
SCALE ½ INCH - ONE FOOT.
SECTIONAL.
ELEVATION.
Charles M. Lancaster
5 July 1868
FLOOR LINE.
FRONT ELEVATION.
GROUND PLAN. "CIRCULAR"

—That is simply a question of bolt power, and a judicious system of washers. If you had insufficient bolt power; for example, if you had for a 10-inch armour-plate only a 3-inch bolt, of necessity it must give way more or less often.

843. On that point you seem to think that it is not by increasing the number of the bolts, but the thickness of the bolts by which the plates should be attached?—That is so precisely; and, in fact, I believe it can be shown that you may, with a structure of that kind [pointing to the sketch], very easily do away with a very large number of bolts: in fact, I believe you may do away with three-fourths of them on the outside plate.

844. By increasing the diameter of the remaining bolts do you mean?—By doing a very simple thing, which I will endeavour to explain to the Committee. Instead of taking the outside armour-plate, and placing it horizontally, as in that design [pointing to the same], I should propose to place the armour-plate vertically, but the base plate as represented here would have a strong toe-piece projecting outside the armour-plate, so that it would hitch into that toe-piece. Then you would have a corresponding thickness of edge here [pointing to the sketch], and it would be just like taking a sheet of paper and holding it as I am now holding this [describing] immovably at the bottom. When an armour-plate is struck it buckles out, and has a tendency, where the impact is, to throw that end out and that end out [describing], and that of course is one of the causes of the bolts breaking; but if you were to render that armour-plate rigid, by keeping the end in top and bottom, then you would dispense with, at least, half the bolts. This exemplifies on a larger scale for other fortifications very nearly the principle which I have been endeavouring to lay before the Committee. I mean the necessity of making every part of the iron-work available, so as to contribute its particular share of strength to the whole design. These [pointing to the sketch] are what are termed Russian bars, which were employed by Mr. Hughes and myself for the construction of fortifications at Constradt; but this also shows another important design, it shows what is rather going away from the particular course of the examination, but which I believe will be proved ultimately, that in all fortifications of iron-work, whether taken as a whole, or taken as an embrasure, you must have an entirety of iron without brick- or stone-work in the design. In this [pointing to the sketch] you have an outside wall of 11 inches and 6 inches, making 18, and altogether 24 inches, you have a "sole" plate, making an oval of 5 feet 6 inches, which receives the whole of the structure, with a corresponding sole plate there [pointing to the sketch], and you connect the two with beams of iron thus [describing]. *This* is a connecting 2 feet 6 inch beam of iron to give support to this [pointing to the sketch]. This would be an inside circle, and this an inside wall of an oval or circular fort. That [pointing to the sketch] is an outside wall, and this [pointing to the same] is the sole plate. This [pointing to the sketch] is merely for connecting the inside and outside circles, just the same as those beams [pointing to the same] supporting the roof; they tie the two together. Then I should remark upon this important point, that this beam [pointing to the same] is also acting on the crown of the arch; and, upon any blow being struck there, it would receive a thrust, and it would be received on the crown of the arch. This beam [pointing to the same] is also circular running round *here* to support the roof.

845. (*Mr. Fairbairn.*) Those are merely, as I understand you, for the support of the roof?—Yes.

846. You would have an immense quantity of iron here [pointing to the sketch]?—Yes; it would cost some money. This is a system by which an endeavour is made to do away with one of the main sources of weakness, and that is the use of the bolts. It would be only necessary to use about one-tenth of the number of bolts that are used in the other way.

847. You will have 2 feet of iron here [pointing to the sketch]?—Yes; but then we know we shall not stop at a 9-inch gun, nor a 13-inch gun; we shall have a 15-inch gun, and larger perhaps than that; and I think it is advisable to be in advance of our time. I should mention that an extra 6-inch plate is put round the port-hole.

848. (*Chairman.*) Can you inform the Committee whether an embrasure formed of the bars which you have now pointed out to the Committee, has ever been fired at, not in model, but in actual full size?—Not in actual full size. It has been fired at in model with very satisfactory results.

849. Can you state what proportion the model of artillery used against the model shield bore to the embrasure?—No; but I think I could let you have it in the course of a week;* but I can say this, that it was a competitive model, because the Russians have had several of these parapets, as they term them, both on the Russian bars, and also armour-plates supported behind by something analogous, although not the same as that [pointing to the sketch], but something of the same kind as that; and in the trial that took place, all the models being to scale, the results afforded the greatest satisfaction to General Todleben, and other Russian officers.

850. (*Mr. Fairbairn.*) Is there not a serious objection to the number of joints which I see here?—Not as compared with the number of bolt-holes; and if you choose between the two, that is a very minor objection.

851. (*Chairman.*) Looking to the experiments which you have seen made, if wood were not so perishable, or if wood could be found which would endure for a considerable time, or some preserving process could be discovered, would you not in that case prefer wood for backing to your system of bars?—In that case I should prefer iron.

852. You do not believe that the absence of vibration in a wooden structure is so great an advantage as has been represented by many persons?—I do not; I think that you may sum up the use of wood in this way—that it is likely to have an effect analogous to skidding a locomotive when you wish to bring it up gradually—that is to say, if you have a deep wooden backing, you certainly bring up the projectiles, not quite so dead or sharp as with a rigid iron structure; but if you wish to obtain out of iron the same property, that of gradually reducing the force in bringing up a projectile—assuming the perforation of the front plate—you can do that by iron in another form, and that is by using hollow stringers, although it takes a certain time to bring up an enormous weight in motion, by arranging your backing in the form of deep stringers that will effect the same object.

853. And equally well avoid the destruction of such fastenings as may be necessary?—I think so.

854. (*Mr. Fairbairn.*) I think, if I have understood you rightly, your objection to wood is on

* Given at No. 1355.

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account of its being perishable?—Yes; that it is perishable and not adapted to the various purposes of our great colonial empire.

855. You have also referred to the rails on a railroad which are laid upon wood, although they have been tried upon perfectly rigid stone which had to be abandoned on account of the rigidity and the vibration that took place, the inconvenience to passengers, and the wear and tear of the rolling stock being very great; but may not wood be found which, if kept perfectly dry and protected from the attacks of vermin, might last for 100 years?—Or it might not.

856. But it might at all events, if it decayed, be taken out and replaced?—I think it would be a very difficult thing to do that. The question really would be, whether it would be taken out at the right moment, or whether the wood might not be found to be decayed at the very time that you wanted it to be sound. The first proposition, I think, is this, is wood absolutely necessary?

857. (*Chairman.*) And I understand you to say that in any case you would prefer iron?—Yes.

858. (*Sir William Gordon.*) The shield you have described is one to have, not only an iron front, but iron sides, an iron top, and an iron bottom: that is what you would recommend?—Yes, it is.

859. Can you state to the Committee what the cost of such a shield would be, 12 feet in length and 8 feet in height for open coast batteries?—To cover the whole detail, gun and men?

860. With a length of 12 feet in front and 8 feet in height, what would be the cost of one shield, according to your plan?—I have not made an estimate of that, but I will supply that when I have my evidence to correct. I think it will be seen that in the case of open coast batteries, you would very largely secure the men from direct and vertical fire, for this mode of construction would be a complete iron casemate in itself, and if it were to cost double the amount, I think the money would be well expended.

861. (*Mr. Fairbairn.*) I suppose you have arrived at the conclusion that although it might require a quantity of iron, at least one-half more, to make a permanent fort than it would require if you used a wood backing; it would be prudent, and, in fact, more economical, to incur that expense in order to render the structure permanent and impregnable?—Yes; I am decidedly of opinion that it would be preferable to employ a larger quantity of iron for a permanent work.

862. (*Colonel Adye.*) Your view, I think, is that the life of a fort is in the gun, and, therefore, you would construct an iron box perfect *per se* for its protection, with sides, bottom, and top, and no backing?—Yes; that is for an embrasure for one gun.

863. With regard to the front of the shield, do you consider it is possible to make a plate that would stand by itself for the front of the shield?—Certainly not.

864. Then you must have some backing?—Yes, in some form; and I should say girders or struts in a particular form.

865. You must have a support?—Yes; a support to the front shield.

866. Do you propose to have arched struts as the best form, or tongued and grooved horizontal beams?—Assuming that I was to use, say, a 10-inch or a 12-inch armour-plate, and we will not talk any more about what I have done for the Russian Government, but I will deal with the question of a 10-inch armour-plate or a 12-inch armour-plate.

867. Will you be good enough to deal with the question of having to oppose the most powerful modern artillery, and say how you would afford support to a front plate of 10 inches; would you employ arched struts or tongued and grooved rafters, as you have mentioned?—I will show the Committee that I have considered the questions I have been asked. I will show them three designs embracing all that you can desire.

868. Will you state to the Committee which of the three you prefer?—I believe that this [pointing to a design] would be found to be as good as it is possible to be for the purpose of putting together an iron structure, or complete work: that is to say, with Russian bars behind, a plate in front, and supported by verticals behind.

869. That is with arched struts, is it not?—No; but this [pointing to the same] is for a complete iron work. If I had to make an embrasure by itself, I should take the arched strut in addition to this [pointing to the design].

870. (*Mr. Fairbairn.*) Instead of having such a number of these bars grooved into each other, would not three plates answer the purpose instead of one?—These [pointing to the design] are 12 by 15, and these are so arranged that in every instance in rolling them the edge of the fibre will be exposed to the shot; it is rolled in volutes like that; it is filled in in the first instance in that way, by the breaking-down rollers, and then it is rolled definitely into that form.

871. You seem to object to wood on account of its being perishable; but do you not think that having wood for a backing is a great means of saving the bolts if you use them?—I believe myself that with properly-made bolts and with a proper arrangement of washers, you can secure your bolts as absolutely without wood as if you had wood, simply taking it on the definition of an elastic medium to absorb the force of the projectile. If you have a proper arrangement of bolt and nut, and washer, you can arrange a backing without any wood whatever. If you arrange it upon that plan properly, you obtain the same result as you would obtain by a combination of wood and iron.

872. You know what the effect was of the two first shots fired at the Gibraltar shield?—Yes.

873. That a great number of the bolts went?—Yes, about 20.

874. Why did they give way?—A great many of them were sheared, and that was from the bending in of the structure and the shearing of the bolts against the sharp edges of the compound plates.

875. They did not give way, in your opinion, from the vibration?—Some of them gave way from defective nuts, but a great many of them were shorn; many of them were not broken, but they were actually half shorn through.

876. (*Colonel Adye.*) I believe the thickness of your fort shield is altogether 24 inches?—Yes; over the sill of the port-holes it is, but there is an extra 6-inch plate round the immediate vicinity of the embrasure. You must have an embrasure, but wherever you cut a large hole, which is necessary for the muzzle of the gun under the present form of carriages, you must necessarily weaken the structure, no matter how it is constructed, and, therefore, to compensate for that which you have taken out, you add one, plus any other thickness of iron, 6-inch plate round the immediate vicinity

of the embrasure on the outside, not on the inside, and that acts as a port stiffener.

877. You spoke just now of hollow stringers being useful; I mean end-on stringers; but do you not think that solid stringers would be stronger?—They weigh much heavier.

878. But leaving weight out of the question, do you not think that solid end-on stringers would be cheaper and stronger than hollow ones?—They could not be cheaper, because they would weigh so much more. The cost of rolling these hollow stringers is only 16*l.* a-ton.

879. Although solid stringers would be rather more expensive, would they not be a great deal stronger?—No; I do not think they would. I do not think you would get more strength out of solid stringers than out of hollow ones, as they are formed.

880. Do you apprehend that the joints at the top and bottom would have much effect in holding the structure together—I mean these small pieces of iron [pointing to the design]?—The main portion of it would have about 3½ inches of overlap to the front of the iron, and it would effectually hold in that front plate at the top.

881. Am I to understand that in the front there are two plates of 6 inches thick each?—Yes; the first plate is a mere port stiffener put round the port; then you have 6 inches over 12 inches of Russian bars, which is merely, as I stated before, to give to the structure that which you have taken out of it by cutting a port-hole in it, in the embrasure.

882. With regard to the bolts, do you think that we have arrived at the maximum of size in bolts of 3 inches?—No; that depends entirely upon the bolt-power required. I call it bolt-power. If you have a 10-inch armour-plate in front, you require to have a 4-inch bolt. I do not think it would be safe to make them under that size. If you exceed the limit of 10 inches, then you must make the bolt in proportion.

883. (*Dr. Pole.*) The plan you have exhibited is for a fort; but, supposing you had simply to construct a shield for an embrasure, would you apply the same principle?—Not precisely.

884. Have you any drawing of such a shield for an embrasure on that principle that you could lay before the Committee?—No; but I will promise this, that when my evidence is returned to you, you shall have a special drawing of what I propose; there is not the slightest difficulty about it.

885. Are we to suppose that it would be composed of a 6-inch plate in front, and that it would be made in several pieces with vertical joints?—Yes; it would be composed of armour-plates of about 5 feet 6 wide.

886. And behind that a series of grooved and tongued bars about 12 inches square?—Yes; 15 inches over the dovetail.

887. Dovetailed 3 inches into vertical bars at about a distance of every 4 feet?—Yes.

888. In addition to that you would also put an extra thickness of 6 inches immediately round the port-hole?—Yes.

889. How would you fasten that to the shield? It would be locked in top and bottom. In the top plate and sole plate there would be four bolts through.

890. Passing through the whole structure?—Yes.

891. Then you would have near the port-hole about 23 or 24 inches of iron?—Yes.

892. You prefer to offer an anvil-like resistance to a shot to putting in anything which would be capable of yielding to the shot and absorbing its work?—Precisely; I believe that the very penetration of heavy projectiles into an anvil-like structure will absorb the work in such time as to break the force of the blow with the least possible expense.

893. Have you made any experiments upon bars of the full size, and made as you have described?—No; but up to scale in comparison with analogous structures of armour-plates, of which I will send the Committee a description.

894. (*Dr. Percy.*) Will you be good enough to say whether you can suggest any convenient plan of greatly strengthening the present Malta and Gibraltar shields, so as to render them thoroughly efficient; and if so at what cost?—It would be difficult to strengthen that shield very much, and as to the cost of it, I cannot give you that without reference to details; but if you will allow me I will take a note of the question and supply an answer.

895. (*Colonel Ward.*) Do you consider the struts which are used in the Gibraltar shield strong enough to support that shield?—I do not.

896. Did they fail at all during the experiments at Shoeburyness?—Many of the bolts began to give way at the bottom of the strut; it did not give way itself bodily.

897. I am speaking of the vertical strut?—The bolt-heads began to shear off, and they have sheared off all along the bottom; and, very likely, if it had been subjected to much more fire, it would have begun to knock up.

898. In what way would it have begun to knock up?—Directly the bolts began to shear off here [pointing to the diagram], the struts would have been shifted bodily backwards.

899. Up to the point at which they ceased firing, were the struts strong enough to support the shield?—Yes; no doubt of it.

900. What part of the shield is your arrangement supposed to give strength to?—Mine is different entirely to the other.

901. If the struts were sufficient up to the point at which they ceased firing, why is more strength required?—If I should suggest a shield instead of the one referred to, I should explain to the Committee that I should not omit the top of the shield or the sides, and instead of having a strut of that form [pointing to the diagram], the tendency being that when it is struck *here*, it may tilt up like that. If you had a top to that embrasure altogether, you would have all your superincumbent weight overhead to keep the embrasure down.

902. Has the shield tried at Shoeburyness ever turned over?—I did not say that it had turned over. I say that it shifted very much, and it has a tendency to turn over. Every time that that [pointing to the diagram] is struck, it lifts up in that form [describing], and comes down again.

903. That is so is it?—Yes.

904. Was that fact noted at Shoeburyness?—I believe I had the honour to point it out to the Chairman of this Committee at Shoeburyness. I do not say that it tilted over, but it must lift up so many inches every time.

905. In an actual fort it would be tied and built in by masonry?—Yes; it would be tied to masonry at the back, and so it was tied down at Shoeburyness; but how could you do that in an actual fortification

906. How was it tied down at Shoeburyness?—It was tied down after that style [describing]; there were two rows of piles, which you could not

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have in a stone-work, and there were fastenings and bolts, and if any one of the shots struck this [pointing to the diagram], it would draw up 6 or 8 inches.

907. Was it so tied down at Shoeburyness?—To the best of my belief it was.

908. In a fort it could be fastened as strongly to masonry, could it not?—No; it could only rest in the masonry, it could not be tied down in front, having no base plate.

909. If the struts are strong enough in the present design; and if that shield could not tilt up, what would be the use of having a stronger strut behind?—Supposing there was masonry all over there [pointing to the diagram], and that you had at the top about 2 feet 6 inches or 3 feet, then suppose that a heavy shot struck the masonry above there [pointing to the diagram], where would be the support at the top, it would carry it away. On the contrary if you had a roof to your embrasure, which I would suggest, that would render you independent of your masonry; and, however much of the masonry was disintegrated, it could only topple down on the top of that roof, and it would keep it in its place. It would add very much to the rigidity of the defence when placed in the masonry contemplated.

910. The shield at Shoeburyness was in the position of a shield without any masonry at the top; it had many shots fired at it, and it did not turn over?—Yes.

911. Yet you consider that the additions you have suggested are required to strengthen that shield?—I should suggest that where you could add to the embrasure an adequate base and a top and sides, you would have a very much more complete arrangement.

912. The object of the addition at the top is, I suppose, to prevent the shield turning over?—No; the object of that addition to the top and sides is to render your embrasure complete in itself, and independent of the masonry or earthwork—in short, making it a complete iron casemate for one gun.

913. With respect to fastening the plates together, do you consider that plates not fastened together are as strong as when bolted together. I mean clamped together at the top and bottom?—There are bolts as well; about five bolts there would be in the ordinary way. There would be some bolts.

914. Do bolts, in your opinion, add to the strength of the shield?—No; they take away from the strength of it.

915. As far as resisting power is concerned, would two plates put together, without any bolts to unite them, be as well able to resist a shot as if the plates were firmly bolted together?—If you had two loose plates they could not be so strong and capable of resisting shot as if they were firmly bolted together. You must combine or unite your structure together, whether by bolts or by dovetails. You must have the parts combined together. What I have endeavoured to lay before the Committee is the possibility of diminishing the number of the bolts; and I do not think that there can be a question that if you can diminish the number of the bolts, and still maintain a good structure, you will have a much better arrangement than you would have with many bolts.

916. Then bolts are, to some extent, a source of strength for the purpose of holding the plates together?—Yes; but you asked me this question, whether, if you put two plates loosely against one another, and they were fired at, they would offer as good a resistance as if the plates were bolted together. I would not have a bolt at all if I could fasten them together without: for instance, if I could clamp them.

917. (*Chairman.*) You would prefer clamps to bolts?—Yes; if I could do all as I wished with them.

918. (*Mr. Fairbairn.*) I suppose the object is to get the whole of the parts combined and united as closely as if it were one solid mass?—Yes; because I think one solid mass is better than two separate ones.

919. (*Dr. Pole.*) If you had two plates fastened together at the edges, and they were struck by a shot which penetrated the first plate, do you not think that the rear plate would then be more likely to give way before the shot, than if it were bolted to the front plate with bolts at more frequent intervals?—That can only be answered by reference to the structure. Behind the rear plate you would have such a power of resistance that it could not give way very well. However, I should say decidedly, that it would be possible to make an analogous structure to that [pointing to the diagram] with a far fewer number of bolts, by having a firm attachment between a series of plates; and, in fact, by a better employment of the means you have than in that design, with a fewer number of bolts.

(The witness withdrew.)

Colonel H. CLERK, R.A., F.R.S., examined.

Col. H. Clerk, R.A., F.R.S.

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920. (*Chairman.*) You are Superintendent of the Royal Carriage Department at Woolwich?—Yes.

921. The Committee will be very glad of any information you can give them on the general subject of the Gibraltar and Malta shields, but a question has arisen with regard to strengthening shields of that character with wooden backing. As the subject of the perishable or durable character of various kinds of timber, and the best means of preserving it, has come before you, will you be kind enough to state to the Committee what process you would recommend for preserving a teak or oak backing as applied to a shield, and to which iron plates would be bolted, or whether you can suggest any other timber, and how long it is likely to last if exposed in casemates and elsewhere?—With regard to teak, I do not consider that that requires any preservation, because it is so durable in itself.

922. Can you state how long a teak backing in the Gibraltar and Malta shield used in a casemate and exposed to alternations of heat and cold, wet and dry, would last, united to an iron structure by iron bolts?—It would be hermetically sealed, as it were, in the shield, and, therefore, would not be exposed to air at all, nor to weather; it would be entirely boxed in, not exposed to a current of air.

923. What process of preservation would you apply to teak?—I should not paint it. Teak is of an oily nature, and when in contact with iron, it preserves it; that is the great advantage of it.

924. But in the rear it might not have any iron over it?—Then it might be painted; there is no other process.

925. Then suppose that oak was used, how

would you deal with that?—There we find that the best thing is to char the oak with a gas flame over the whole surface.

926. And the bolt-holes?—Yes; that is the difference between oak and teak; oak does not agree with iron, the oak corrodes the iron, but the teak, from its oily nature, preserves the iron.

927. How long do you consider such a backing could be relied on, or in how many years would it require to be changed?—As to teak, I do not know that it might ever require to be changed. I should say 30 or 40 years, and oak, when it has been charred by a gas flame, will last a long time.

928. (*Mr. Fairbairn.*) Supposing that teak was used as a backing for the Gibraltar shield, very carefully put in, along with ribs of iron 6 inches or 10 inches thick, and then carefully pitched or hermetically sealed, so that no wet could get to it, would it not last for 100 or 200 years?—Yes, I think so; it is the most durable of any wood that I know.

929. Would the ends be equally durable; would it not perish at the extremities?—I have never seen teak perish. I never knew a case of rotten teak, unless it was from a defective tree originally.

930. If it were well selected, there is no reason to be drawn from its perishable character why it should not be used as a backing for armour-plates?—None; it is the most durable wood that I know. There is only one objection to it, and that is its splintering.

931. There is no danger of dry rot?—I have never known dry rot in teak.

932. These are armour-plates [pointing to a diagram], suppose these to be filled with teak, and to be made perfectly tight top and bottom, and so pitched or otherwise covered over, as that neither air nor water could get to it?—Then it would be hermetically sealed, and would last for ever, as far as one can judge. It never changes its form; it does not shrink, and it is the only wood that I know of that does not. It would, therefore, always be tight.

933. Supposing that this plate [pointing to the same] was struck by a shot, and driven in upon the wood, so that it got loose, might it not be repaired so as to be made perfectly water-tight again?—Yes.

934. It is more than probable, is it not, that in every fort of the sort contemplated there will be a cover over the top?—It should be protected from water resting on the top of it, because if wet got in at the ends, it might be injurious.

935. (*Chairman.*) In an open battery, and not in a casemate, do you apprehend that the upper surface of the wood could be properly protected?—It would be well painted, and as long as you fill up the pores you will prevent the wet getting in.

936. (*Mr. Fairbairn.*) Your belief is that teak would last for a great length of time?—Yes; I do not know whether it might not be plated over, or a cover put on; the wet should be kept out certainly by pitching or painting.

937. (*Chairman.*) Some inexpensive mode of excluding the wet would, in your opinion, be quite sufficient?—Yes.

938. (*Dr. Pole.*) Civil engineers who send out railway stock to India, use teak wherever they can for the under frames of their carriages, under the impression that it is not only very durable there, but that it withstands the ravages of the white ant, is that your impression?—I do not think it does. We have tried teak for shell bottoms, and we have sent it out to India, and it has been attacked by the white ant. Woods which contain aromatic oils are the only ones which are not attacked by the white ant.

939. You have obtained evidence that teak is liable to their attacks?—Yes; some shell bottoms were sent to the West Indies and some to the East Indies, and they were attacked.

940. Do you think that for fortifications in countries where the ants exist, teak applied as is suggested would suffer from their attacks?—No; not if it were hermetically sealed up with the iron; the white ant then could not get through it, otherwise I know of nothing that will keep out the white ant, except cedar, and woods containing aromatic oils.

941. Do you know whether green-heart will effectually resist the sea worm?—It is not a wood that we have had much experience of; it is very brittle, but we have used it where we wanted great strength. As I have stated before, teak will splinter, and there is a sort of poison in it, so that when men are wounded by splinters of teak the wounds fester.

942. Are you acquainted with the processes for injecting wood with preservative fluids, such as Burnet's solution, creosote, or sulphate of copper?—Yes; we have tried the sulphate of copper, but that must be used with very young woods; it will get through poplar.

943. Or fir?—Yes.

944. It would not be applicable to any of the woods likely to be used for backing?—Not to the hard woods. We find that for English woods, charring them with a gas flame is as good a plan as any.

945. Your opinion is that, with the exception of insect ravages, teak backing would be practically everlasting?—Yes; I think it would last longer than English oak.

946. If it were hermetically sealed?—Yes; not if the wet lodges on it, and gets into the pores. It is not the hardest wood, but I say that it is the most durable.

947. (*Chairman.*) Have you any further remarks to make on the wood with which these plates are to be backed?—Where we want strength we find that with two pieces and cross-graining them, we get a great additional strength, and a solid block of teak is the best timber that I am acquainted with.

948. You know of none that would be a good substitute for teak?—I know of none more durable. The only thing necessary is to prevent the effect of splinters.

949. (*Dr. Pole.*) Suppose that a shell reached the timber, do you think that in its hermetically sealed condition therewould be much danger of its taking fire and burning?—Not where it was so excluded from the air. Anything sticking into it might, but a shell going in would blow the whole thing to pieces.

950. The wood would only char if fire could get to it; it could not burn without air?—No; it would be charred all round.

(The witness withdrew).

Mr. William Baskcomb, Admiralty Overseer at the Thames Ironworks, examined.

Mr. William Baskcomb.

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951. (*Chairman.*) The Committee are anxious to ask you some questions in reference to your experience of shields in general, and the Malta and Gibraltar shield in particular, and as to the advantage and necessity, or otherwise, of wooden backing for shields?—I have always been in favour of a wood backing on account of its elasticity.

952. Do you apprehend that the 5½-inch plate, which was the front plate of the Gibraltar shield, would have stood longer with a wood backing than on the 5-inch plate which then supported it?—It was supported by a 5-inch plate and an inch-and-a-half plate.

953. What amount of backing do you consider that 5-inch and 1½-inch plate to represent?—We always reckon 9 inches equal to 1 inch of plating; that is our rule in the Admiralty.

954. Do you apprehend that you would have required 4 feet of wooden backing to represent the 6½ inches of iron backing which were applied to that 5½-inch plate?—I should prefer, and I think it would have stood better with 2 feet of backing substituted for a portion of the plating.

955. You saw the target at Shoeburyness fired at?—Yes.

956. Looking at the question without reference to fortifications, if you were anxious to make that target capable of resisting the same description of gun, what method of strengthening would you adopt before it was fired at again?—I regret to say that I did not come here prepared to answer these questions. I have not sufficiently examined the target. I only saw it on the day of trial, and I have not considered the best method nor the strength of the wood backing that would be required.

957. Did you consider the shield, when you first saw it, equal to resisting the guns that were opposed to it?—No; I said that it would not stand when I saw it.

958. What led you to form that opinion?—My experience at Shoeburyness.

959. Did you think that there was not sufficient substance in it?—Yes; not sufficient depth or body.

960. It was not its construction, but there was not enough iron in it to resist the guns fired at it?—That is what I thought; but, on the other hand, I reported to the Admiralty two years and a half ago, that any target constructed on that principle would be very prejudicial to the fastenings.

961. Was that owing to an apprehension that the shearing process would take place, which did take place, or that they would be broken by the jarring?—It was the jarring.

962. Was that because there was not sufficient elastic washers, or generally, without looking to the question of washers, because you believed that two iron plates bolted together were likely to cause such a vibration that the bolts would give way?—Generally, as I have always been opposed to rigid structures for targets.

963. Can you give the Committee any evidence as to the thickness of an iron plate which, in your opinion, ought to be opposed to any given gun of any diameter or calibre?—I have not given that subject any consideration. I have constructed targets, and I have always had all my instructions as to thickness from the Controller of the Navy's Department.

964. You cannot give the Committee any official information on that point?—No, but it could be obtained.

965. What timber, in your opinion, is the best to use for backing?—East India teak.

966. For what reason?—The first and principal reason is on account of its durability.

967. Is it more durable than English oak?—Yes; English oak would not stand, because it is subject to the dry rot. I am not certain whether teak is subject to it, but I know that it is liable to get the dry rot from being in the neighbourhood of oak timber which is tainted with it.

968. Is it subject to the ravages of the white ant?—I think it is, but it could be protected.

969. How long do you think teak, if fairly protected from the weather, will last as a backing to iron plates bolted to it?—That would greatly depend upon the quality of the teak, some teak would not last more than 10 years; but other teak, with plenty of oleaginous matter in it, such as the Malabar teak or good Moulmein teak, I think, would last 20 years and upwards. We have teak ships in the Navy, the "Hastings" is one, and I think she is nearly 50 years of age; she is in a comparatively sound condition. I also went on board the "Meanee," at Woolwich, last Saturday, on purpose to look at that ship, and I could not see any rot about her; she is 20 years old.

970. Is there any other timber that you can mention besides teak which might be used for the purpose of backing armour-plates?—I have had no experience of any other timber for that purpose except oak. Green heart I know a little about. I was before the Dockyard Committee some years ago when they asked my opinion respecting this kind of wood, and I then stated that I thought it would be serviceable for the keelsons of ships, but we had had so very little experience of it at that time that I was doubtful about it. Since then, however, it has been used for inside planking, and for clamps, and also for keelsons in Her Majesty's service. The great difficulty that we have with green-heart is that we cannot tell the sap from the heart, at least we shipbuilders think we can, but the timber merchants say that we do not know. They want us to believe that sap is heart, and it appears to be as hard as the heart itself. At the present time we have merchant ships with keelsons of this material, and they have gone as round as the timber when it was growing, showing that what they thought was heart was really sap. It perishes, leaving part of the fastenings bare.

971. You believe that if teak was well selected and used with proper care as a backing to an embrasure, it would require to be examined frequently, and to be changed at least once in 20 years?—I would not go the length of saying that it would require to be changed, but I think it ought to be examined. I must beg to say that the question you have asked me is a very difficult question to answer, because sometimes rot gets into the timber, and we cannot account for it. I should like to know whether it is to be subject to wet and dry, or always kept under cover.

972. Supposing it be used in an embrasure for a casemate such as that [pointing to the model], you can judge for yourself what amount of exposure it would have to wet and damp and climate?—It would be covered up, I suppose, and in that case it would be just the same as the wood backing of our ironclads.

973. In that case, how long do you suppose it would last?—We are all in doubt about that, but

in the "Warrior" no rot has yet been discovered and she was launched in 1860.

974. (*Mr. Fairbairn.*) Supposing a backing of well-seasoned teak to be put behind armour-plates, and then hermetically sealed, so that neither air nor wet could reach it, would it not last for a long time?—Yes; judging from what I have seen, it might last 40, and even 50 years, provided the timber was of the best quality.

975. When completely closed up, and the air and wet excluded, why should it not last for a greater number of years?—There is no particular reason why it should not.

976. (*Chairman.*) Do you preserve the wood by any process at the bolt-holes?—Teak does not require any preserving. We generally paint the bolts at the time of driving, and also the inner surfaces of the wooden backing. We fit the armour-plates against the wood backing with Hay's waterproof glue. We make the composition or the glue hot, and pay the outside surface of the backing with it, and we make the armour-plate warm, so that the plate goes up warm, and it adheres, making solid work; that is the plan we adopt with the Admiralty-built ships.

977. (*Mr. Fairbairn.*) You have seen the Gibraltar shield at Shoeburyness?—Yes.

978. Supposing it had a good backing of teak well supported behind, do you think that would add much to the security of the shield?—It would be a considerable advantage to the fastenings; first of all you would have the drift of the bolt, that is, the tightness of the bolt going through the wood, you would also have longer bolts, which would be an improvement, especially if the Palliser system were adopted, and it would give elasticity to the whole structure. I have found, and have so stated in all the Reports I have made, that those targets which have been made on the elastic principle have always stood the best.

979. You believe that a backing would serve as a cushion, and take off the jar which is so destructive to the fastenings?—Yes; it disperses the effect of the blow.

980. If a backing of the kind mentioned had been attached to the shield, it is a question whether it would not have stood very well?—Certainly; if you had a backing, I should say—indeed, I am certain, that 2 feet of backing added to the structure would have kept out the shot from the 9-inch Woolwich rifled gun.

981. (*Chairman.*) Where would you put it, between the front plates, or in the rear of the two plates, and the skin in the rear of that?—I should put the skin in the rear, as in the case of ships, and I would put the armour-plate outside the wood.

982. And the second armour-plate inside?—No; I think I should put two armour-plates outside, and a 1½-inch plate inside, and the wood between.

983. Would you not then have the very disadvantage that you have spoken of, the vibration coming between two armour-plates?—Yes; and I did not think of that at the moment; I was thinking of a solid plate, because I should prefer a 10-inch plate.

984. (*Mr. Fairbairn.*) Supposing you used a 10-inch plate instead of two 5-inch plates, with a good backing, such as you have described, are there any guns at Shoeburyness that you think would send a shot through that plate?—The 600-pounder, I think, would very nearly do it, if not quite. I think it would do great damage to the target.

985. (*Sir William Gordon.*) When you speak of the durability of teak, would the term of its duration apply to the hot climates of Malta and Gibraltar?—Some allowance must be made for climate. A target had been erected at Shoeburyness for experiments, which did not come off, and it was allowed to stand there for about two years before the experiments were made. Another target was erected and fired at immediately after; both of those targets were constructed under my superintendence, and I believe the teak that was used in them was very nearly the same in quality. It was found that the teak which had been standing for two years was rather more brittle than the teak which had been fired at soon after its use, so that I must draw a little distinction. I think that teak would not last in any hot climate, so long as in a moderately cool climate.

986. I am supposing it to be enclosed?—The teak I referred to just now was exposed to alternate wet and dry, and hot and cold weather. Teak goes at the heart when it decays naturally, and I am afraid that in a hot climate the heat would dry up the oleaginous matter in it, and that it would be left dry; but I have had no experience upon that point.

987. You think that it is doubtful whether teak would last for 40 years in shields at Malta and Gibraltar?—Yes; I think it is doubtful.

988. (*Colonel Adye.*) You are of opinion that backing is good on account of its elasticity in saving the bolts?—Yes.

989. Can you account for this, that in the Gibraltar shield the bolts on the second occasion did not give way as they did at first with no wood backing?—There are two reasons why they did not give way on the second trial. Colonel Inglis explained to me the improvements that had been made. I took a hammer and I tapped the bolts, and found that none of them were held tightly by the nuts, although an elastic substance, composed of elm wood and Clarkson's patent cork material—an inch in thickness of each—was placed under them; and that is one reason why they held. Then I observed that a wood packing was fitted around the bolt to stop the shearing action, and the inside edges of the holes of the front plate rounded. I am not certain whether the bolts sheared, or whether they were broken, because I have not seen them; but I think it is not at all improbable that they were partly sheared and partly broken. The plates may have buckled and the edges turned outwards, but I was not present to see the effects produced.

990. The result was that on the second occasion the bolts did not give way as they did at first, or at all events very few of them gave way?—I do not know how many of them gave way on the first occasion.

991. Does not that show that you can construct a rigid target in such a way that the bolts will stand without a wooden backing?—Yes.

992. The difficulty, as far as the bolt fastenings go, is already overcome?—Yes; but there would be this advantage, if the bolts were driven in tightly through the wood, you would have less strain on the nuts, and especially with teak, for the longer the bolts are in teak the tighter they get, on account of its gummy and oily nature; this matter accumulates round the bolts, and renders the bolts very tight.

993. Still there are ways of enabling bolts to stand without a wooden backing?—Yes; I was saying to Colonel Inglis that I thought if he had

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had an Admiralty washer, it would have assisted; you then would have tightness and elasticity combined.

994. You said that if the Gibraltar shield had had 2 feet of teak backing, it would have been much stronger?—I said so, but I have not gone into the question.

995. At all events, you consider that a considerable backing of teak would be of use?—Yes; I am certain in my own mind that the elastic principle is the principle by which to get the best resistance to impact.

996. (*Mr. Fairbairn.*) I suppose you consider that screwing up the bolts very tight brings a severe strain upon them, and is apt to cause the bolts to break more readily?—Yes.

997. They should not be severely screwed up? No; still there would be a jar if you did not screw them up tightly. I am not certain, with a rigid structure, which would prove most destructive to the fastenings; but the last time the shield was fired at, there was an advantage in the bolts being allowed to be loose, because you had a cushion underneath them, and the bolts had to be drawn some distance before any strain was brought upon them, but that would not do for armour if required to be under water.

998. Upon the whole, you think that a soft backing, so as to modify the jar from the effects of a shot striking an armour-plate, is a very great advantage?—Yes; that is my opinion.

999. (*Colonel Adye.*) Is there not a great difference in the qualities of teak?—Yes.

1000. Which is owing to the different places where it is grown?—Yes; we generally use the Moulmein teak for shipbuilding purposes.

1001. Some of the Burmah teak is very hard, is it not?—Yes; and some of it is very soft. I allude to large overgrown teak, which is bad. I saw some timber the other day at Blackwall, and I said that I could not allow that to be used for armour backing. It was 2 feet 6 inches square, and I saw that the heart of the timber was gone. There were already symptoms, not of *the* dry rot, but of *a* dry rot. We always look for fungus when searching for the dry rot, which is partly caused by the juices of the timber exuding, and producing it on the surfaces. When we see fungus we know that there is dry rot.

1002. (*Mr. Fairbairn.*) I suppose that that appearance would be an indication of decay from old age?—No; not from old age, but from disease.

1003. (*Colonel Adye.*) I understand that teak which has been grown in low marshy soils grows quickly, and is bad teak, while that which is grown in the high lands is much better?—That is correct; the Malabar teak is very good generally.

1004. (*Dr. Pole.*) I believe you have seen from the first almost all the experiments which have been made upon these targets?—I have seen most of them.

1005. You may recollect that with reference to wood backing, the Iron Plate Committee said, "The advantage of a wood backing is fourfold. First. It stops small fragments of iron from entering a ship. Second. If large pieces of plate are broken off, it holds them in their places, and makes them still useful to a certain extent. Third. It deadens the jar, and preserves the fastenings in the structure generally. And, fourth. It distributes the effect of the blow over a larger area of the skin and frame of the ship." Then, in their final Report, they said, "We have been unable to recommend that wood backing should be dispensed with, as it appears to perform important functions, for which no thoroughly-efficient substitute has been found." Since that Report, in 1864, has anything occurred that you know of to alter the opinion so expressed by the Iron Plate Committee?—No.

1006. Do you think that these advantages are of such a nature that they might be applied, under certain arrangements of construction, to shields for land defences, or in any case where iron is to be fired at by shot?—Yes.

1007. Your experience would lead you to concur in the opinion expressed by the Iron Plate Committee?—Yes, certainly; although I have never before heard of that Report.

1008. The experience gained since that time has rather confirmed the opinion than altered it?—Yes.

1009. Have all ships which are at present built with armour-plating a wood backing?—Yes.

1010. (*Mr. Fairbairn.*) You approve of the Report referred to?—Yes, I do: I would endorse the whole of it.

1011. (*Chairman.*) Have you anything further to add?—No.

(The witness withdrew).

Adjourned till Wednesday, the 15th instant.

Wednesday, 15th January, 1868.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Chair.*

Major-General Sir WILLIAM GORDON, K.C.B., R.E.
Colonel ADYE, C.B., R.A.
Dr. PERCY, F.R.S.
Dr. POLE, F.R.S.

Captain HARRISON, R.A., *Secretary.*

Captain ARTHUR W. A. HOOD, R.N., H.M.S. "Excellent," examined.

Capt. A. W. A. Hood, R.N.

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1012. (*Chairman.*) Have you made a report to the Government with regard to a target which experiments were tried on, a sample of those which have been sent to Gibraltar and Malta, and which has recently been fired at at Shoeburyness: were you present at those experiments?—I have made no report to Government with regard to experiments tried on targets similar to the shields sent to Gibraltar and Malta. I was present at the last.

1013. Have you had considerable experience in firing at iron plates with 9-inch guns?—None with 9-inch guns.

1014. What is the largest sized gun with which you have recently experimented?—The only rifled gun of which I have seen any practice against

iron plates is the 7-inch gun with the Palliser projectile, and with different charges up to battering charges.

1015. What was the thickest iron plate?—Brown's 8-inch A 1 plate.

1016. And at what range?—At 30 feet.

1017. Did you fire with the battering charge, or with charges reduced to represent the difference of range?—I fired with three different charges, 12 lbs., 14 lbs., and 17 lbs., at 30 feet, 22 lbs. being the battering charge. I have not fired with 22 lbs., because I was afraid that the shot would go through the backing.

1018. Did you fire at the shield both with shot and shell?—Not with shell. The projectile was the 115 lbs. solid Palliser's projectile with different shaped heads; three shot struck with a radius of 1 diameter, and three of 1½.

1019. Those were the two forms?—Yes.

1020. How was that plate backed?—On 40 inches of good teak or oak backing, bolted on in the ordinary manner with long bolts completely through, and nutted, not the Palliser bolt, but the ordinary 2¾-inch bolts, not 3-inch, conical-headed.

1021. Were they attached with one or two nuts?—With one nut and iron washer.

1022. With no interposition of any other soft substance?—Nothing.

1023. About what was the area of that plate?—I cannot speak exactly. I believe it was 14 feet by about 4½ feet, and 8 inches in thickness.

1024. Do you happen to remember what kind of bolts they were and at what distance the bolt holes were from each other?—I have already described the bolts. I cannot state the exact distance between the bolt holes.

1025. Do you remember the diameter of the bolts?—They were 2¾-inch bolts.

1026. Can you state the results of the firing with both descriptions of shot, and with different charges?—I have with me an account of the result of an experiment with six Palliser shots fired with different charges to ascertain the different penetration of the shots; three shots being of the old pattern with the heads, struck with the radius of 1 diameter, and three with a radius of 1½ diameter. The first shot was with the new head, with 12lbs. of powder, and the depth of indent 6½ inches. The second was with the same charge with the old head, and the depth of indent 5½ inches, making an inch difference in each case. The third shot was with the new head, with 14 lbs. of powder, and the depth of indent 7·28 inches. The fourth shot was the old head, with 14 lbs. of powder, producing 6½ inches of penetration. The fifth shot was with the new head, with 17 lbs. of powder, and the point went just through $\frac{1}{10}$th of an inch. The sixth and last shot was with 17 lbs. of powder, the old pattern head, and the point just showed through, not actually through. By far the most serious damage done to the backing was by the fifth shot, which was with 17 lbs. of powder, and the shot struck with 1½ diameter.

1027. Then the sharp head did the most damage to the backing?—Considerably the most damage.

1028. Could you state what was the result on the back of the plate?—The damage on the back of the plate was considerably more by the sharp head. I made sketches myself of each hole and each crack, and each separate fissure made upon the back of each plate by each shot, and in every part the damage was considerably more from the sharp point.

1029. Was the plate so broken at the rear as that any portions of the plate itself were detached from the plate and forced into the backing?—No; it was opened out and thrust on each side of the shot. *Capt. A. W. Hood, R.N.* 15 Jan. 1868.

1030. Has the plate been taken down and examined since?—Yes.

1031. Is it a plate of a very good character?—It was a Brown plate which had been previously tested by me, and received the mark A 1.

1032. How did the bolts stand?—Very well indeed.

1033. Will you state to the Committee what is the usual test?—Nine 68-lb. shots fired with a 13-lb. charge, at a distance of 30 feet; a common cast-iron shot. Four shot are fired describing a square of 9 inches from centre to centre, five shot are then fired in a vertical line passing through the centre of square.

1034. (*Dr. Pole.*) The extreme dimension being how much?—18 inches horizontally, by 36 inches vertically.

1035. So as to cover an area on the plate of about 18 inches by 12?—I cannot speak exactly upon that point. It would be larger than that; it would cover an area of a little over 3 square feet.

1036. Have you stated to the Committee all the information that you possess with regard to that plate?—Yes, with regard to the 8-inch plate; but I can give evidence on experiments made on 6-inch and 7-inch plates with the 6½-ton muzzle-loading rifled gun.

1037. Will you be so good as to give us the result of your experiments?—The experiment was carried out with three shots from a 8-ton gun, with charges of 12 lbs., 14 lbs., and the full battering charge of 22 lbs., against a 6-inch Cammell's good plate; the plate being, as before, on 40 inches of backing, and the shot the old pattern head, 1 diameter. With the 12-lb. charge, at 30 feet, the depth of indent was 7·4 inches through the plate and into the backing; with the 14-lb. charge, the depth of indent was 11 inches; and with the 22-lb. charge the shot went through the plate and through the backing, and broke up against a 4½-inch plate in the rear of the backing, the most extraordinary penetration I have ever seen.

1038. Had it struck on the plate in rear with the point?—Yes.

1039. And had it effected any penetration?—No; it had not effected any penetration; it just left a mark, I should say, not more than 1-8th of an inch in depth. We had a 4½-inch plate, about 20 feet in the rear of the backing, to prevent all accident.

1040. Have you tried any other experiments, of which you can give the results?—Yes; with the 7-inch plate, with the old-pattern-head shot. Four shots were fired from the same gun at the 7-inch Brown's A 1 plate, with charges of 12 lbs., 14 lbs., and two of 22 lbs. With the 12-lb. charge, the depth of indent was 5·63 inches; with the 14-lb. charge, the depth of indent was 6·9 inches; with first 22-lb. charge, the depth of indent was 7·4 inches, and with second 22-lb. charge it was 6·25 inches.

1041. Do you deduce from that, that as far as the 7-inch plates are concerned, with the ordinary battering charge, the plate is just about sufficient to resist a gun of its own diameter?—My opinion is that, with the battering charge, a 115-lb. shot with the old-pattern head, will get the point through the 7-inch plate, but not penetrate it.

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1042. Is it your opinion that a plate a little thinner would be easily penetrated?—The 6-inch-plate, I think, would be penetrated easily.

1043. Do you deduce from that the law which has been stated by the Controller of the Navy's Office, that, as far as the 7-inch gun is concerned, a plate of the thickness of the diameter of the gun, if it be a good one, is just about equal to resisting a shot from that gun?—I consider that law to be correct.

1044. Have you any positive information with reference to the effect produced by guns of greater diameter of bore, on plates of proportionately greater thickness?—None, except from experiments which I have read of.

1045. Is it your belief that any such law as that which has been suggested may be assumed to be correct?—I should not like to give an opinion upon the subject, except with regard to the guns which I have actually seen tried.

1046. Have you seen any case of firing at iron plates which have been placed upon more rigid backings than wood?—I have never seen any.

1047. In those cases which you have just been relating to the Committee, did you find that the bolts stood well?—I have only seen one nut broken in all the experiments that I have seen on board the "Thunderer."

1048. Even in those cases where they were without any washer but the ordinary iron washer?—Without any washer but the ordinary iron washer.

1049. It has been stated to the Committee, with regard to the shields which are now under discussion, that they might be approached, as you are no doubt aware, at Malta, within point-blank range of ships; supposing a hostile ship to approach within point-blank distance of the shield covering a gun on the fortification there, would it be your opinion that the accuracy of the fire of the ship would be sufficient to ensure the striking of that shield frequently or several times, the size of the shield being 12 feet by 8 feet?—The accuracy of the firing must depend entirely on the smoke.

1050. Looking to the chance of smoke, looking to the chance of anxiety, or whatever it may be called, which renders firing in action not so steady, perhaps, as it is on field-days, and looking to the general character of what does happen on those occasions, what chance do you think that the five guns on the broadside of the "Bellerophon," specially directed against the battery, would have, at 200 yards, of striking a given embrasure of 8 feet by 12 in a given number of shots?—With but little smoke, and slow, deliberate firing, I should say that the shield ought to be struck once in three times; but taking into consideration the usual state of things in action, I believe it would be quite a chance striking the shield with any frequency. I do not believe that in action the Captains of the guns would have an opportunity of seeing the shield clearly once in seven or eight minutes, taking into consideration the smoke from their own guns, as well as the smoke from the battery at so short a distance as 200 yards.

1051. In the case of a ship passing into a harbour, or passing land defences, at from 200 to 400 yards, what chance would there be of repeatedly striking such guns in a battery?—I believe it would be very chance work indeed. I should say that not more than one shot in six or seven would strike the shield, because a ship passing a battery would naturally wish to get past as quickly as she could.

1052. (*Colonel Adye.*) Comparing the experiments which you have seen with shields with wood backing, with the experiments which you saw at Shoeburyness, do you consider that the rigidity of the shield at Shoeburyness had a good deal to do with the breaking of the bolts, as you are probably aware that on the first occasion a great many bolts were broken, and on the second a certain number were broken?—Yes; I am aware of that.

1053. Do you think that that was owing to the shield being made entirely of rigid materials?—I am not aware whether, on the first occasion, there was any wood lining around the bolts.

1054. There was an indiarubber washer only on the first occasion, and on the second occasion there was a wood washer and a cork washer; will you have the goodness to state whether, comparing the effect on the rigid shield at Shoeburyness with the effect produced on the shields which you have seen with wood backing, you attach great value to wood backing?—Yes, I do; and I attach the greatest value to wood backing for many reasons.

1055. Have you any other reason than that of saving the bolts?—Yes; wood acts as a cushion, and distributes the blow, and it also prevents the splinters, which otherwise would pass into the battery. My own opinion with regard to the shield at Shoeburyness is that it might be made to protect the men a great deal more by placing 6 inches of horizontal backing in the rear of the $1\frac{1}{2}$-inch plate, with an iron skin in the rear of the wooden backing. I believe that the splinters resulted from the small plate, which we had in the rear the other day, of $1\frac{1}{2}$ inches, and the fragments of iron would have been stopped by a horizontal wooden backing. There were many splinters passed through that might have wounded or killed many of the gunners the other day, and which would have been prevented by a wood backing and an iron skin.

1056. Would you prefer having the wooden backing to having another plate of iron in that shield?—If the Committee will allow me, I will state what I think would be an effective shield. I think that you must have different shields for different purposes. In the case of a battery which a ship can approach within 100 yards, and where there is no question of the weight of the shield, I should prefer to have a 9-inch plate in front, and a 5-inch in the rear of that, and 6 inches of wooden horizontal backing and an iron skin. I do not believe that any shot would penetrate that.

1057. When you speak of a wooden backing, do you mean that it should be entirely of wood, or that it should have what are called end-on stringers?—I would have iron stringers in exactly the same manner as the "Bellerophon's" wooden backing.

1058. Had the backing which you have spoken of any stringers at all?—No; it was all wood.

1059. Do you think that those end-on stringers would enable you to dispense with a certain amount of double backing?—Yes; but it would be expensive fitting them in the "Thunderer."

1060. But in the application of wood backing to shields on shore, you would advocate having end-on stringers inserted in the wood backing?—Yes; certainly.

1061. Supposing that there was an objection to wood as being perishable, do you think that a shield could be made entirely of rigid material,

and that the bolts would still stand?—I think so. instead of wood, I would have horizontal plates of iron end-on, made up solid, close together, and in contact between the skin and the other plate.

1062. Do you not think that they would be apt to break up, by the shot penetrating the front plate?—No; not with the 9-inch plate first, and then 5 inches. I do not think that a shot would have power to break that up.

1063. Do you mean that this backing should be between the 9-inch plate and the skin?—No; between the 5-inch and the skin: there should be two plates in front, then the backing, and then the skin.

1064. (*Dr. Pole.*) Would such a backing be better than a solid plate of the same thickness?—It might not be better, but I do not think that you would require a solid plate; it would be very much cheaper, and so much more easy to re-place.

1065. (*Colonel Adye.*) When you speak of laying a plate of iron horizontally, an inch thick, would not you rather have the plates several inches thick, and then lay them in contact. Would not they be less liable to break up?—Perhaps they would. I think an inch with wood backing would be about the thickness, if you are going to combine wood and iron together.

1066. Have you formed any opinion in your own mind as to the size of the guns that sea-going ships are likely to carry with which to attack land defences?—I do not myself think that guns heavier than 12 or 14 tons would be found to be worked easily and correctly on broadside.

1067. That would be about a 9-inch gun, would it not?—Yes.

1068. In a turret?—In a turret you may mount a 22-ton gun. I see no reason why you should not.

1069. Then that would be a 12-inch gun?—Yes.

1070. (*Dr. Pole.*) You have described to the Committee the results of several shots fired at the 8-inch plate. Were they each of them shot at a fresh part of the plate?—Yes; each shot was fired at a fresh part of the plate.

1071. Taking the heaviest charge, which was 17 lbs. as you have said, the result on the back was that it opened; were there any cracks in the plate, or what was the nature of the damage done to the plate, not only as regards penetration, but as regards the general appearance of the plate at the back?—There were very large fissures, in one case between $2\frac{1}{2}$ inches in width radial.

1072. And consequently, of such a nature that the plate would probably be very much weakened, and another shot near the same spot would go far to break up pieces of the plate?—I think so, certainly.

1073. Do those 6-inch plates bend and buckle much?—They buckle a little, not so much as the thinner plates.

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1074. They crack more, do they not?—The 8-inch plate cracked more, and there was more damage done in the rear of the 8-inch plate than there was in the rear of either the 6- or the 7-inch plate.

1075. Is it your opinion that the energy of shot which would in a thin plate be expended in buckling the plate is expended more in a thick plate in cracking it, because the thick plate cannot buckle so much as the thin one?—That is my opinion.

1076. In every case of thick plates, does not that appear to be the result?—Yes.

1077. Have you tried the 10-inch plate?—No; we are going to try it.

1078. What was the iron like in this fracture which you have referred to; did it appear good?—Very good indeed. This was a plate which had previously been tested, and marked A 1; it was a very good plate made by Brown.

1079. Did the plate appear to peel off in layers as if different portions if it were badly welded?—I never observed that in Brown's plates. I have always observed it in another maker's plates, but never in Brown's, or Cammell's.

1080. The iron appears quite homogeneous, does it, and well welded?—Yes.

1081. Are any of those plates that have been shot at to be seen?—Yes; there are a great many of them in the Dockyard at Portsmouth.

1082. (*Dr. Percy.*) You have stated that in the case of this plate the fracture presented a good appearance as far as the quality of the iron was concerned; what do you consider to be the characteristic of a good fracture, that is to say, a fracture indicating a plate of good quality?—A fracture with no indication of separation in the laminæ, and showing a good formation of the grain of the iron.

1083. (*Chairman.*) You are about to experimentalize upon the 10-inch plate, are you not?—Yes.*

1084. When is that firing to take place?—We do not know the exact day when the plate will be ready, but I should imagine that it would be within the next 10 days.

1085. (*Colonel Adye.*) With regard to the difficulty of hitting a shield from a ship owing to the smoke, do you think that the same difficulty of smoke would arise with a very large gun in a small turret ship; would not such ships be able to go in close and see the shields?—There would be far less smoke in a turret ship, because in a turret ship you would not have more than two guns firing, whereas in a broadside ship you would have five or six; therefore, there would be less smoke from their own guns in a turret ship.

The witness delivered in the following paper:—

* See Appendix XVI., p. 128.

Date.	Number of Round.	Nature of Ordnance.	Projectile.				Charge in lbs.	Elevation.	Deflection.	Effects.				Remarks.
			Nature.	Weight in lbs.	Form.	Length in inches.				Depth of indent in inches.	Diameter of indent in inches.	Ripple round circumference of hole.	Bulge of plate in inches.	
1866.								°	° ′					
July ..	1	8-in. Shunt ..	Firth steel	150	Hemispherical	12	30 L.G	5	10 0	4·25	10·5	..	$2\frac{5}{8}$	8″ Brown & Co's. "Hercules."
	2	7-in. Whitworth	Whitworth's compressed steel, hollow screw cup base ..	$133\frac{1}{2}$	Flat	18·7	20 L.G	..	9 0	3·95	8·37 Ext. 8·18 Int.	..	$2\frac{1}{4}$	
December .	1	7-in. Service ..	Chilled shot	114	Ogival head, struck with radius 1 diameter	$14\frac{1}{4}$	22	..	11 0	9·	7·75	..	2	Ditto ditto.
February 1867.	1	8-in. Shunt ..	Steel, solid	150	Hemispherical	12	30 L.G	1	Direct	3·2	10·0	..	$1\frac{1}{8}$	9″ Brown & Co's. "Hercules."
November	1	7-in. Service (224)	New pattern (sharper than Service) chilled, cored	115	Ogival head, struck with radius $1\frac{1}{2}$ diameter	14· 7	12	..	1 30	6·5	$7\frac{3}{8}$	..	$1\frac{3}{8}$	8″ Brown, & Co's. "Captain."
	2	„ „	Old pattern chilled, solid ..	115	Ogival head, struck with radius 1 diameter	14	12	..	3 0	5·5	$7\frac{1}{4}$	..	1	
	3	„ „	New pattern	115	Ogival head, struck with radius $1\frac{1}{2}$ diameter	14·7	14	..	5 30	7·28	$7\frac{1}{4}$	..	$2\frac{1}{4}$	
	4	„ „	Old pattern	115	Ogival head, struck with radius 1 diameter	14	14	..	5 30	6·5	$7\frac{1}{4}$	..	2	
	5	„ „	New pattern	115	Ogival head, struck with radius $1\frac{1}{2}$ diameter	14·7	17	..	2 40	Left in; point 1″ to rear of plate	$7\frac{3}{8}$	..	4	Most serious damage.
1866.	6	„ „	Old pattern	115	Ogival head, struck with radius 1 diameter	14	17	..	1 40	Left in	$7\frac{1}{4}$	..	3	
July ..	1	8-in. Shunt ..	Frith steel, solid	150	Hemispherical	12	30 L.G	$3\frac{1}{2}$	Direct	$8\frac{1}{4}$	..	..	..	Penetrated plate.
	2	7-in. Whitworth, 7 tons	Whitworth's compressed steel, hollow screw cup base	$133\frac{1}{2}$	Flat	18·7	20	$2\frac{1}{2}$	Direct	5·51	9·75 Ext. 12·25 Int.		$4\frac{3}{4}$	6″ Brown & Co's. "Hercules."
	3	„ „	„ „ „	$133\frac{1}{2}$	„	18·7	20	1	Direct	5·85	9·75 ×9 Ext. 13·5 Int.		5	
December .	1	7-in Service ..	Chilled shot	114	Ogival head, struck with radius 1 diameter	$14\frac{1}{4}$	14	..	3 0	Point through 11″	7·75	$1\frac{1}{2}$	$5\frac{3}{4}$	6″ Cammell & Co's. "Monarch."
	2	„ ..	„	114	„ „	$14\frac{1}{4}$	12	..	3 0	7·4	7·5	$1\frac{1}{2}$	4	
	3	„ ..	„	114	„ „	$14\frac{1}{4}$	22	..	3 0	Through	7·75	1	4	
	1	„ ..	„	114	„ „	$14\frac{1}{4}$	12	..	11 0	5·63	7·25	$1\frac{1}{2}$	$1\frac{3}{4}$	7″ Brown & Co's. "Monarch."
	2	„ ..	„	114	„ „	$14\frac{1}{4}$	14	..	11 0	6·9	7·4	$2\frac{1}{4}$	$2\frac{1}{2}$	
	3	„ ..	„	114	„ „	$14\frac{1}{4}$	22	..	11 0	7·4	8.0	$\frac{3}{4}$	4	
	4	„ ..	„	114	„ „	$14\frac{1}{4}$	22	..	11 0	6·25	8·25	$\frac{3}{4}$	3	

Mr. WILLIAM CLAY, Managing Director of the Mersey Iron and Steel Works, examined.

1086. (*Chairman.*) The Committee have been assembled to ascertain some facts with regard to the use of iron for land defences, and we should be very glad to receive from you any information that you can give us upon that subject, as you have no doubt considered it. Also we are anxious to obtain information with regard to the manufacture of iron plates, which has so much improved since the date of your former examination, now some five or six years ago. Will you have the goodness, first of all, to state what is the thickest plate which you are now prepared to make, and also to describe its area?—We shall be prepared to make, with our present machinery, without any alteration, and we have been making, rolled plates about the Admiralty size, from 16 to 17 feet long, from 3 feet 3 inches to 4 feet wide, and from 8 to 9 inches thick.

1087. Supposing it were considered desirable, without increasing the area of those plates, to shorten the length, and to increase the width, what width, as a skilled manufacturer of iron, do you think you could attain to, if you were not limited by considerations of expense?—By a very trifling alteration in our machinery we could make plates 7 feet wide.

1088. Would plates of that width be equally well welded, do you suppose?—Yes; by a simple alteration of the furnace.

1089. It has been suggested that when you come to a greater width the pressure of the rollers is not sufficient to extrude cinders, and that you do not get a sufficiently well-welded plate, and that the edges are more burnt: are you of that opinion?—I do not think that that would depend so much upon the width as upon the thickness. You would have the surfaces exposed to the fire equally, I think, in all thicknesses and in all widths.

1090. What thickness do you think it possible to attain to in rolling plates, speaking from your general knowledge of manufactures?—I do not think that there would be any practical limit to the thickness, provided machinery were obtained somewhat larger than what is at present used.

1091. What per centage in the increase of the value of the plate do you suppose, speaking roughly, may be considered as the increase of price for each increase of an inch in thickness?—That is a difficult question to answer.

1092. What is your contract price per ton now for 5-inch plates?—29*l.* and 30*l.* a ton, whether it was 5 or 6 inches, it would make no difference. The next size is 8 inches, and then you would require about 2*l.* a ton more, I think, as a general rule, you might say 1*l.* an inch per ton. I think a manufacturer would take it at that addition, and probably, as a rough estimate, 1*l.* a foot might be considered equivalent for width beyond 4 feet.

1093. Have you any information to give the Committee with regard to the manufacture of bolts by which the armour-plates are attached?—I have had no experience.

1094. Have you seen any iron plates fired at?—Yes, a good many at Portsmouth and other places. I have had a good many private experiments at Liverpool.

1095. Up to what thickness of plate?—Up to 8 inches.

1096. With what description of artillery have you seen an 8-inch plate fired at?—With Mackay's 8-inch gun.

1097. With what weight of projectile?—A 150 lbs. bolt.

1098. Could you describe the form of the head?—It was slightly rounded.

1099. Do you know the velocity with which that plate was struck?—I have been informed by Mr. Mackay, from experiments at Shoeburyness, that the velocity was much greater than that of the 68-pounder. I think he stated that it was as much as 2,100 feet a second.

1100. At what range were you firing in the experiment you witnessed?—At 70 feet.

1101. Was the plate unbacked?—Yes.

1102. What was the result?—The result was that the 8-inch plate was so small that it was not pierced; it was sent head-over-heels down the shore, it having been merely backed-up with some sand. It was indented considerably, and cracked, but not penetrated.

1103. What was the area of that plate?—It was not more than 4 feet by 3. There were some gentlemen from Foreign Governments present who wished to fire at it. Then we fired the same gun at a target which was made with a plate which should have been of the size of the Agincourt target plate, but it was nearly one-eighth thinner. The target was made by Mr. Laird, exactly in the manner in which the Agincourt target was built: in fact, of the same materials; and if that target had not been made, the materials would have gone into the Agincourt. It was thoroughly penetrated by Mackay's 8-inch gun and 6-inch gun. He commenced with a charge of 20 lbs. of powder and repeated it, I think, with a charge of 14 lbs. I am not sure whether it was 14 lbs. or 16 lbs., because I did not take any memorandum, as they were Mr. Mackay's experiments. The rifle motion was obtained by the wad, or by the gas, and the shot was spherical, made of steel.

1104. Have you been at Shoeburyness during any of the experiments upon the shield which we are now discussing?—No; I have no knowledge of that shield.

1105. Have you any opinion to express to the Committee with regard to the duration, under fire, of a structure which is built solely of iron, as compared with a structure built partly of iron and partly of wood?—No; I have no information, but merely an opinion, from what I have heard and seen, and with regard to which the Committee know better than I do, that iron does not seem to me to be a suitable backing, and that wood seems a much better backing for plates than iron.

1106. Have you heard of nothing to lead you to change or doubt the correctness of that opinion? No.

1107. (*Colonel Adye.*) There is a rule which is supposed to be a correct one, that the strength of iron plates increases according to the squares of their thickness. Is it your opinion that that is a correct maxim?—I should rather accept it as a dictum of this Committee than as knowing anything of my own knowledge.

1108. Do you not think, that as you increase the thickness of the iron plates, they do very largely increase in strength?—I think so, under certain conditions: that is to say, if you take a mass of iron a foot thick, and roll it down into a plate 6 inches thick; and if you take another mass of iron a foot thick and roll it down into a plate 8 or 9 inches thick, you would certainly, to my mind, not have the same resistance in the

latter as you would have in the former case. I believe, to use the words of ironmakers, that you have not sufficient work upon it. You must, in order to elongate the grain or fibre of your iron, put a certain amount of elongation in the last process in the rolls. And if you take a mass of iron and roll it down 5 or 6 inches thick, you very considerably elongate and produce fibre; whereas if you take the same thickness originally, and only reduce it to 8 inches, you do not get anything like the same amount of toughness compared with the thinner plate; but that is no reason why you should not get an 8-inch plate as tough as a 6-inch plate; and then should you get that, you would get your pile 16 inches high instead of as in the former case, with the 6-inch plate, a foot high. I believe it is known to have considerably more proportion than that.

1109. Do you think that it is quite reliable that the strength does increase in that rapid ratio as you increase the thickness?—Yes; if the same rules with regard to the elongation of fibre are observed. I imagine that all the manufacturers in this country have erected machinery to make armour-plates 4½ or 5 inches thick. Their machinery was perfectly suitable, and their furnaces were perfectly suitable, and they could roll them and get the proper amount of work upon them to produce the fibre; but now, when the plates are required to be 9, 10, or 12 inches thick, the machinery is not sufficient to cope with that, and to get the same result as we did with 5 or 6-inch plates. But that may be easily obviated by having the machinery somewhat increased. In the first place, to turn out 9-inch plates, it would merely be a question of altering the furnaces. I believe our own machinery is sufficient to cope with plates a foot or 15 inches thick, the machinery is sufficient; it is merely a question of heating power.

1110. It has been stated that a plate of 5 inches, or about that thickness, on receiving the shock of a shot, buckles to a certain extent, and therefore saves itself, whereas, when you get to a thicker plate, it stands so much more rigid that it is liable to break; do you think that that is likely to be the case, and that the shield with the thicker plate is more liable to fracture than the other?—I have had more experience of Portsmouth than of Shoeburyness, where the plates are held as rigidly as possible by bolts upon a wooden backing; and there, I think, it would not apply, because the plate there, which I saw tested with five shots in a space not more than 18 inches square, you did not find the plates buckled. If you were to put a straight-edge upon the plate after it was fired at, it would be found to be a little buckled, but not of any practical importance, because the plates are so firmly held.

1111. (*Dr. Pole.*) Have you had experience of the trials of plates much thicker than 6 inches?—No; I have seen experiments with 7 and 8-inch plates tried, of which one or two were tried with 68-lb. shot. The 6-inch plate had five shots put in, four touching one another and joining, and one in the centre. The 7-inch plate had seven shots; five as before, and one in each of the two first shot-holes. I cannot remember exactly what the test for the 8-inch was.

1112. That is to say, in the 7-inch plate, seven shots are delivered over an area of about 18 inches square?—Yes; and the four shots just touching each other.

1113. Have you seen plates not thicker than 6 or 8 inches, when they have been taken off, and looked at the backs of them?—Yes.

1114. What is the result upon the back of the thickest plate you have seen, as compared with a proportionate gunshot upon a thinner plate; do thick plates buckle as much as thin plates?—No; they are stiffer.

1115. Do they crack more?—I think there is rather a tendency to crack more, but it is a question whether that is not on account of the method of manufacture.

1116. It has been suggested that the force of the shot which, on a thin plate, tends to bend and buckle it, is rather expended in a thick plate in cracking and breaking it; does the plate appear as if it were broken more in proportion, and bent less in proportion, than a thinner plate fired at with a proportionate charge?—I think not. I do not judge only by my own plates, but by other plates which I have seen in Portsmouth Dockyard. With 8-inch and some 9-inch plates of other makers, I think that is not the case.

1117. You do not think that they are more inclined to crack than thin ones?—No.

1118. You have not seen plates of more than 8 inches tried?—No.

1119. Are they much distorted at the back, and more opened and exfoliated?—No; I think not so much, perhaps, in proportion, or I may say not more in reality, than the thinner plate: that is to say, they would not make a greater impression on the backing. I think eleven shots were fired at the 9-inch plate; and after those shots, I think the bulge at the back of the plate was not more than what would be the case with the 6-inch plate after five shots.

1120. It has been said that thick plates have a tendency to crack and fly to pieces under a fire which would result, perhaps, in bending a thinner plate; but that, as I understand, has not been your experience?—I think that the quality of the thick plate is not equal to that of the thinner one; but I believe that that has been more because we have not been able to cope with masses sufficiently thick in the first instance. We have not been able to put sufficient work upon them.

1121. What is your opinion as to the prospect of the iron manufacture in making plates still thicker, say up to 10 or 12 inches think; do you think that there is a prospect of their being made so as to obtain the strength which is due to that thickness?—I should think that there would be no difficulty, provided that you have machinery sufficiently powerful. For instance, ten years ago it was thought perfectly impossible to make a plate 4 inches thick; and any iron manufacturer in those days would have said that such a thing could not be done—that they could not be welded. Now, it is not only perfectly feasible, but much larger plates are made with the greatest facility.

1122. (*Chairman.*) Is there anything further that you would like to state to the Committee?—There are a few matters that I should like to mention. With regard to the plates that are sent to Shoeburyness, and the plates which are sent to Portsmouth for experiment, the system is very different. The plates at Portsmouth are bolted rigidly on to teak or oak backing, whereas the plates at Shoeburyness are fired at without any backing whatever. I believe that it required a different quality of plate entirely to resist in those different positions; and, moreover, that it required a different quality of plate to cope with hard shot, either steel or case-hardened shot, with a high velocity from an ordinary 68-pounder, and with a moderate velocity from a 68-pounder gun. In fact, the plate which we sent to Shoeburyness,

which was pronounced to be of very excellent quality, was hammered and rolled in a new manner, or rather it was not a new process, for it had been tried before some years ago; but I imagine that we should get solidity by the hammering, and that we should get tenacity by rolling the hammered slab afterwards, and at Shoeburyness I think that we succeeded in our attempt. The plate resisted the impact of, I am not sure whether it was the 9-inch gun or the 7-inch gun that was tried against those steel plates. There were seven or eight plates tried together; it was the 7-inch gun with a considerable charge of powder, and this resisted the impact very remarkably, and more especially of oblique shot which was fired against it, which scooped out 4 inches square of the thickness of the plate without damaging the plate. I obtained permission of the Admiralty to send a plate to Portsmouth for experiment, made of the same material, by the same men, the same furnace, and manufactured in exactly the same way; this plate was tested at Portsmouth, and the fifth shot broke a piece completely out of it, and it was pronounced B 2 or B 3.

1123. Might not that be attributable to the fact of the uncertainty as to hardness which is said to occur in plates which are hammered?—It was afterwards rolled to take all the hardness out of it, and there was the same amount of pressure and the same amount of elongation of fibre in both cases. Plates which have been tested in the usual manner at Portsmouth with five 68-pounder shots at a low velocity, have been tested at the same time with Palliser and steel shot at an unharmed portion of the plate at a high velocity, and the plate which obtained a low character for resistance against the 68-pounder shot, stood in a remarkable manner, and without the slightest crack or fault, the hardened shots at a high velocity. I may observe that I have made a considerable number of experiments with regard to plates lately. We were asked some time ago, by the Ordnance Select Committee I think it was, to furnish a plate of a somewhat harder character than those usually supplied with a view to arresting this hard shot. We had got into the groove of making our plates hard, which has led us into some trouble at Portsmouth; but we began making our plates considerably harder, more especially after the success which we considered attended the manufacture of that plate at Shoeburyness; and in trying the experiments, I had been of opinion that the hardness of the material arose rather from mechanical than from chemical causes; but I think, from the experiments that I have made, I must now come to the conclusion that the chemical composition of the raw material from which those plates are made has a great deal to do with the softness or the quality of the plate. I may, perhaps, mention another matter to the Committee, namely, solidity. The plates in the British service are condemned; supposing a plate to have considerable ductility and softness in other ways, if it were not perfectly welded, it is condemned on that score alone. At the French Exhibition there were two plates which probably the Committee have seen, which were rather remarkable. Apparently they were thrown together in a rough manner from narrow bars of iron; they were so imperfectly welded that there were places in the edges of the plate which you could put your hand in. They were fired at with heavy shot. I am not aware of what the velocity of the shot was, but from the appearance of them they were apparently steel shot, and from the distortion of them, it would appear that they had been fired with considerable velocity, and yet those plates which were only of a moderate thickness seemed to resist, in a very remarkable manner, much better, I should imagine, than any plates which have been made in this country. It has suggested itself to my mind, in consequence of that, whether, when we are so rigidly adhering to perfect solidity, which can only be obtained by, to a certain extent, damaging the structure of the iron by over-heating it, we are not too rigidly adhering to that quality of solidity or non-lamination. A question arises whether in those very thick plates it is not desirable to use both the hammering and rolling processes. If the rollers are capable of dealing with masses of iron, say, up to 8 or 9 inches thick, if you come to heavier masses, it is very probable that it would be desirable to hammer them and make them solid first, and roll them afterwards. I am rather inclined to that opinion from some experiments which I have lately made. A plate, which I spoke of before, which had been condemned as brittle, I re-rolled from 8 inches to 5 inches thick, and I found that its toughness and tenacity were increased very considerably.

1124. Do you mean over its former condition, or over that of an ordinary 5-inch plate?—Over its former condition, and probably in its present condition, it would be considered satisfactory.

1125. (*Dr. Percy.*) Has that plate been tested?—No; but it could be tested; there would be no difficulty in getting it to Shoeburyness or Portsmouth. It was just a trial that I made for my own satisfaction. The plate is there, and it would involve no more expense than the carriage of it.

1126. (*Dr. Pole.*) It is the general opinion that the hammering process gives plates a certain amount of hardness, which is disadvantageous, do you agree in that opinion?—It is a question whether that has arisen from any deleterious effects from the hammering, or from the fact of the material not being so soft as what had been employed for rolled plates. It appears to me that the plates that have been hammered both at the dockyard at Portsmouth and elsewhere have generally been made from scrap iron, which is a treacherous material, and not generally to be depended upon. We have never had any experiment with plates that have been made from new iron of a similar nature to those plates which are rolled.

1127. Are we to conclude that you would not advise using plates that are hammered entirely, but that you prefer rolling them afterwards, even if they have been hammered in the first instance, in order to make them fibrous throughout?—I think it induces a fibrous structure through the outer parts which will then acquire softness and toughness, but leaving the interior somewhat in of a harder nature, which would probably resist hardened projectiles in a superior manner.

1128. If a plate were hard originally, do you think that rolling would make it softer?—Yes, decidedly. In one instance we took a hammered slab of about 9 inches thick, and on breaking a piece under a hammer with great force, the fracture was of an entirely crystaline nature; but when that plate was afterwards rolled, and a piece was cut off, for an inch in depth, that plate was entirely in a fibrous state, but the interior was crystalline as before.

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1129. (*Dr. Percy.*) How would you determine the degree of toughness?—From experience, more than anything else; by its fibrous or crystalline structure.

1130. Not by any mechanical test that you would apply to those two plates respectively?—No; in order to test the toughness of different bodies of iron, I have tried putting a shot on a plate and dropping a heavy steam hammer upon it with the greatest force that we could apply, but I could not see any perceptible difference in the indentation.

1131. (*Chairman.*) Could not you endeavour to ascertain, satisfactorily to yourself, the character of the plate, by taking a portion of it and elongating it under a strain to test its ductility, and breaking it under a hammer to test its fragibility and so on, or by indentation and punching?—I have tried all those ways, and cannot come to a satisfactory conclusion.

1132. (*Dr. Pole.*) Do you know the American plan, which is described in that large book of experiments on iron which has been published, by dropping a punch upon the iron from a certain height, and then noticing the indentation?—No; the way that I have endeavoured to get at it was by taking a certain thickness of iron of different qualities, and taking it to the steam punching machine, and by giving the engine a certain amount of steam until it nearly brought the punch up with a plate of known softness, and then trying what the effect would be with plates of other iron; but I found that it was not satisfactory. The plates which were considered hard plates were punched with ease. It was a very rough way of experimenting.

1133. (*Dr. Percy.*) Would the application of a file, by a very expert hand, afford any indication whatever of the hardness, so as to enable such a person to determine it approximately?—I think not; and I think the hardness is very often induced in the manipulation of the iron. I have had slabs of iron $2\frac{1}{2}$ inches thick before rolling them into armour-plates. I have had them of the most perfect fibrous nature; five of them have been put together and made into armour-plates, and they have been perfectly crystalline.

1134. Can you deduce the hardness from the character of the fracture?—Yes.

1135. (*Dr. Pole.*) Is it not the fact that persons accustomed to iron can form a very good notion of its quality by the fracture and the general appearance of the iron?—The general impression of the Iron Committee, that iron with a long silky fibre is a soft iron, and that iron which breaks up with a sudden fracture is a hard harsh iron.

1136. (*Colonel Adye.*) You have spoken, have you not, of the trials at Portsmouth, and the effects of 68-lb. shots compared with the Palliser shot from a rifled gun, and you have referred to the 68-pounder being fired with a comparatively small velocity?—Yes; fired with a reduced charge of about 13 lbs. of powder; 3 lbs. were taken out of the charge, which was supposed to compensate for the difference of firing at 20 feet and at 200 yards. Admiral Key tried experiments on a plate, and from the indentation he judged that, with the 13 lbs. of powder, at 20 feet, the distance that is now fired from the "Thunderer," the effect produced was equivalent to what was originally produced with 16 lbs. of powder at 200 yards.

1137. Were they firing the Palliser shot, also, with reduced charges?—No; I imagine that they fired the Palliser shot and the steel shot with full charges to see what the effect would be upon the plates, and the effect was very satisfactory; for plates which were condemned, when fired at by the 68-pounders at a low velocity, would have been pronounced most excellent plates if they had been fired at with hard projectiles at a high velocity.

1138. Which shot showed the deepest indentation?—The hardened shot; both the steel and the Palliser made an indentation of about 3 inches against 1·7 inch, for ordinary cast-iron.

1139. When you spoke of the effect of the 68-pounder, did you refer to the several shots fired at about the same place?—Yes; the first shot makes no sign; at the second shot, there is no experienced gunner who can tell whether the plate is going to turn out a good one or not. At the third shot, if it is a very inferior plate, it begins to show symptoms of distress; at the fourth, it opens out and cracks more, and if it is a very bad plate, the fifth will take a piece out.

1140. Supposing you fired five Palliser shots from a rifled gun close together, what do you think the effect upon that target would be?—Very much the same I should think.

1141. Then you were comparing one rifled shot against five 68-pounder shots?—Yes; but I have seen Palliser and steel shots put very close together on a so-called inferior plate without damaging the plate, or in a very slight degree, and if the plates were judged as they used to be judged, when the practice was over, they would have been pronounced most excellent plates.

1142. In fact, the result of one set of shots is to break the plates, and of the other to punch them?—Yes; the one punches them clean through. In the case of one that we had at Shoeburyness, there was a 7-inch shot fired at it, and it showed somewhat more resistance than any of the other plates there, because the back end of the shot did not go through, the point only went through; but the result was a clean punched hole, without any starring or cracking. There is a question with regard to solid embrasures which I should like to refer to. I believe that there has been brought before this Committee a plan for making the shields solid, or, at any rate, in a few pieces (instead of in a number of plates, as they are now) by means of making large hammered or rolled slabs. I think that the size of those shields is about 12 feet in length by about 8 feet high. If it were preferred, and it has been proposed, to have them made of 18 inches of solid iron, I do not think there would be any difficulty in having them made in two pieces, either with a joint in the centre, or a joint at either the top or the bottom of the shield. We made in that manner one of the first shields that was made. It might be made with the greatest facility 18 inches thick of solid iron, joined either in the direction of the upper line or of the lower line [describing the same on a diagram], leaving one piece about 6 feet wide, and the other about 2 feet. With a very slight alteration of our machinery I believe that those could be made, and I am sure that I would undertake to make those shields in one solid block 12 feet by 8, and 18 inches thick.

1143. (*Chairman.*) Would they be hammered or rolled?—Hammered. That is a question that has never been fairly tested. The rolled plates have hitherto carried off the palm in plates up to 6 or 7 inches thick, but in plates above that thick-

ness it is a great question whether hammered plates might not be equal, or even superior, to rolled plates in tenacity and resistance.

1144. (*Dr. Percy.*) Would the cost of the manufacture be the same in the case of hammered as in rolled plates?—I think that the hammered would be somewhat less costly.

1145. (*Dr. Pole.*) You would make the hammered plate, I presume, by a series of scarf welds?—Yes.

1146. That is the only way, is it not, in which you can put the pieces together?—Yes; I do not say that it is impossible to put the whole mass together. I think that might be done. The fibre of the iron might be put in any required direction; and it would be possible, I believe to make a shield in one solid mass at one operation with one piling, without those scarf welds.

1147. (*Dr. Percy.*) Could you make one plate 12 feet by 8 feet in one piece?—Yes; and 18 inches thick, by some slight additions to our present machinery.

1148. What would be the cost?—An estimated cost, not exceeding that of the present shield, I would make them in quantity at 30*l.* to 35*l.* a ton.

1149. (*Dr. Pole.*) You think it would be possible to make a shield 12 feet by 8, and 18 inches thick, in one piece, and at a cost not greater than that of the present shield?—Yes, in quantity.

1150. And you think that the quality of such a shield would be good, and that the welds would be good, and the iron of good sound quality?—Yes. *Mr. W. Clay.* 15 Jan. 1868.

1151. (*Chairman.*) You have stated, have you not, that you do not consider the welding material?—Yes; I believe that by hammering you would get more solidity than by rolling.

1152. You would get more brittleness also, would you not?—It is a question whether the greater hardness of hammered plates does not arise from the original quality of the iron out of which they are made.

1153. (*Dr. Pole.*) If you were asked to make such a shield as an experiment, would you be prepared to make it with your present means?—I could not make it 12 feet by 8 with our present means, but I could make it in two plates.

1154. (*Dr. Percy.*) Can you work iron of exactly the same quality equally well under the roller and under the hammer?—Yes, and *vice versâ;* there is no difficulty about it.

1155. Some irons stand that process much better than others, do they not?—Yes; some, as we term it in practical language, stand a great deal more fire. The hardest iron will stand a great deal more fire; for instance, the old Yorkshire iron, the Lowmoor iron, will stand an immense amount more fire than other irons, such irons as the weak cinder irons, which will hardly stand fire at all, and melt away almost like cast-iron.

(The witness withdrew.)

Monday 27th January, 1868.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Chair.*

Major-General Sir WILLIAM GORDON, K.C.B., R.E.	Lieut.-Colonel WARD, R.E.
Colonel ADYE, C.B., R.A.	W. FAIRBAIRN, F.R.S.
	Dr. PERCY, F.R.S.

Captain HARRISON, R.A., *Secretary.*

The Rev. F. BASHFORTH examined.

1156. (*Chairman.*) You have had considerable experience in artillery experiments?—Merely with regard to the resistance of the air, and measuring velocities. *The Rev. F. Bashforth.* 27 Jan. 1868.

1157. To what kind of artillery experiments have you directed your attention?—When I was appointed Professor of Applied Mathematics to the Advanced Class of Artillery Officers, in 1864, I soon came to the conclusion that we must have a chronograph capable of measuring and recording several observations on each shot.

1158. Have you completed any experiments? Yes; we have completed some experiments with variously formed heads of shot. A series of experiments was made in 1866, to find the resistance of the air to heads of shot of different forms, with entire success.

1159. Have you any other experiments in progress?—Yes; we have one in progress, and this is to be the final one. I am now engaged, in conjunction with the Director of Artillery Studies, and the Professor of Artillery at the Royal Military Academy, in making an experiment with bores of 3 inches, 5 inches, 7 inches, and 9 inches, the elongated shot having ogival heads, struck with a radius of $1\frac{1}{2}$ diameter, the form that seems likely to be used. We found so little difference in the resistance of the air to the forms of the heads likely to be used, that now we only vary the diameters; in the first set the diameter was the same for all the shot. The object now is to find the resistance of the air so far as it depends upon the diameter of the shot, and this experiment will, I trust, give us the means for calculating the velocity of any elongated projectile at any distance from the gun.

1160. Do you hope to be able to find the means of calculating the velocity of an elongated projectile at any given distance from the gun?—Yes, I do. Indeed, I am certain of it, having given the initial velocity.

1161. Have you no spherical shot experiments?—No; when this experiment was arranged, the spherical shot were not thought so much about as at present; no proposition was made to include spherical shot. The experiments now in progress were proposed in October 1866, and sanctioned about April last. The 3-inch shot have been already fired.

1162. Have you considered the question of the

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penetration of iron plates?—I have not made any experiments, but I have been obliged to consider the subject in connection with the Advanced Class, and I have no doubt that the laws which govern the penetration of iron plates can be now made out with sufficient exactness for all practical purposes.

1163. Do you think you can now state pretty clearly the laws which appear to you to govern the penetration of iron plates?—There are no less than seven things to be taken into account. First, the form of the head; second, the material of the shot, that is, whether it will keep its form; third, the iron plates, whether they can be made sufficiently uniform. Those, I believe, may be considered constants.

1164. How would you then proceed?—If I was going to make systematic experiments, which would be the least costly if there was time, I should consider that there are still four variable quantities to be dealt with. First, the thickness of the plate; second, the diameter of the shot; third, the weight of the shot; and, fourth, the velocity of the shot. I should arrange the experiments so that only two of these quantities should be made to vary at the same time. I will suppose a gun, the bore of which was 3 inches, and I would have shot of 12 lbs. and 9 lbs., with maximum charges of 2 lbs. of powder. I would then take three thicknesses of plate, 2 inches, $2\frac{1}{2}$ inches, and 3 inches, and I would begin by firing at the 2-inch plate with a full charge, and I would reduce it by equal quantities. I would then take the $2\frac{1}{2}$-inch plate, and fire at it in the same manner, until I found that the shot would not penetrate—I mean by reducing the charge; I would measure the velocity of the shot both before and after penetration, in order to find the work which was done on it in each case. I believe that there is a great deal more work done with a high velocity than with a low velocity—that is, that the shot makes a larger hole. In order to measure the velocity of the shot before and after impact, I should place seven or more screens at every 50 feet, and put the plate before the fifth. I would take the velocities in the same manner on the same instrument, and I should know exactly the power consumed for each penetration.

1165. With what object is this arrangement proposed?—If a constant resistance was offered to the penetration of a projectile, then the depth of penetration would be in proportion to the *vis viva* lost. They found, at Metz, when firing into clay, that the shot causes a trumpet-shaped opening of this sort, and they tell you that the work done is proportional to the volume of the opening, so that a penetration of a yard here [pointing to a paper] would consume much more work than a yard there. I believe there is something lost in like manner in the penetration of the plates with high velocities. But the common theory of resistance to the penetration of shot supposes the resistance to be partly constant, and in part to increase as the square of the velocity, consequently there is a greater loss of *vis viva* with high velocities than with lower velocities for a given penetration.

1166. How do you explain that?—Because the greater the striking velocity of the shot, the greater would be the lateral velocity imparted to the particles it strikes. I have examined some of the recent effects produced by experiments, and find that the 6·9-inch shot made holes of $7\frac{1}{2}$ inches in diameter when fired at high velocities.

1167. The same shot might be expected to make a larger hole in a plate the higher its striking velocity was?—Yes, by this theory; and I think it is so practically. They have generally tried with just sufficient velocity to penetrate.

1168. Supposing it was required to compare the power of a 9-inch rifled gun against laminated plates and solid plates, how would you proceed?—I would fire against two 4-inch plates, one upon the other, and against an 8-inch plate, and measure the velocity both before and after impact. According to the theory, that the resistance of a plate is as the square of its thickness, one 8-inch plate ought to be equivalent to four 4-inch plates.

1169. Do you think that would be found to be true?—No. Looking at the results of some experiments with shots of 6·9-inch against plates of $4\frac{1}{2}$, $5\frac{1}{2}$, and 7 inches in thickness, it appears as if this law was approximately true when the striking velocity was just sufficient for penetration. But when we have a number of plates, one over the other, the first is struck with a much higher velocity than the second. Therefore, most probably, there would be a greater loss of *vis viva* in penetrating the first layer than the second, and so on.

1170. (*Colonel Adye*). If you fired at one 4-inch plate, the result would be 16, and if you fired at another, the result would be 16, but if you put those two plates one behind the other, surely the result would be 32?—It would be according to that calculation, but experimentally, I think it is not true.

1171. Is it not true that two plates, placed one behind the other, must offer more resistance than if the two plates were not so placed?—Yes; because there is a loss of power in penetrating the first so as to leave sufficient force to go through the second. You want the first to be struck with much higher velocity than the second.

1172. Is there nothing due to the support which the second plate gives to the first?—I cannot tell that. I cannot separate the two. I take it that all the force is used up in penetration, and whatever force is exerted against the second plate must be partly useful in penetrating.

1173. I am supposing that you fire at a plate 6 inches thick, unbacked?—Yes; I am supposing them all to be unbacked.

1174. Suppose a plate 6 feet in length, merely supported at the two ends, and that you fired at the centre of it, you would penetrate it with more ease, would you not, than if you fired at the same plate which, instead of being supported merely at the ends, was so supported that there was only a foot between the supports, instead of 6 feet; or would a shot penetrate with the same ease a 6-inch plate?—I do not know. I think it would depend upon whether the plate was bent; if so, there would be so much lost work. I have only seen the targets which have been shattered by experiments. There was one plate of 11 inches which had been supported at the two ends, and that was broken in the middle. As to theory, we have no theory about iron plates. The theory of the penetration of uniform media of great thickness rests with the French, and depends upon what they have done at Metz in the course of their experiments on the penetration of clay and earth, &c., but still what has been done is sufficient to show the kind of work done by a shot when it penetrates any substance. The particles struck have a side velocity impressed upon them, and the higher the velocity the wider will be the opening caused by a given shot.

1175. I gather from what you have stated that

your experiments would begin with small guns and thinner plates?—Yes; I would begin with a 12 lb. shot and a 2 lb. charge of powder; that would go through a 2-inch plate with a great deal of velocity to spare; but you would be able to see whether the loss of *vis viva* was the same for the different velocities.

1176. Then I presume that these experiments on a small scale would be for theoretical and not practical purposes?—I think that if we go on in this way we shall be able to ascertain the law. You might go up to 9 inches, and, if so, you might be able to say what the law of penetration would be up to 13. I think it is useful to begin on a small scale. I do not propose anything beyond 9 inches, and I am doubtful whether it is even necessary to go to 9 inches, because small things often give an indication of a law. If you get the facts up to 9 inches, I think they may be sufficient to tell you the power as to the larger ones, but I cannot be certain.

1177. (*Colonel Ward.*) With respect to one plate backing another, do you think that the hinder plate of a target assists the front plate to resist a shot?—If the velocity is not sufficient to go through both plates.

1178. Then it does afford assistance to the front plate to resist the shot?—That I cannot say. We have really had no experiments. If the shot did not go through, I should say that it would assist the front plate.

1179. Do you consider that the penetration of shot varies inversely as the circumference of the shot?—No; but I have no experiments to show it. I have just looked out these to which I have referred, and until systematic experiments have been made, one cannot express any opinion.

1180. (*Dr. Percy.*) I wish to ask you whether, in order that the results obtained by experiments on small plates should be applicable to large plates, it is not necessary to assume that there should be, in every case, uniformity of quality?—No; but still sufficient uniformity for the purpose.

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1181. May there not be great differences in the quality of thick plates?—Yes; I mean what it would be in practice. I do not mean to say that two plates of different thicknesses will be of precisely the same quality. The proposed experiments would give perfectly good results, if, as you increased the thickness of the plates, there was a gradual, not necessarily uniform deterioration in the quality of the iron. Up to a thickness of 6 inches I am told this deterioration is not sensible. I propose to go on with others, and to connect the two. I think from a bore of 3 to 5 inches would be too great a step. We are to have a 5-inch gun adapted for the experiments in progress.

1182. Have you considered the question of the effect which is due to the obliquity in the direction of the shot?—No; that is an entirely experimental question; we cannot tell that. I think the question must be made as simple as possible to begin with.

1183. That question of obliquity is one, however, which will tell very much in practice, according to the form of the head, and the nature of the shot?—Yes.

1184. (*Chairman.*) Is there anything further that you would wish to state?—In mentioning the 3-inch gun, I suppose that this is to be carried on to a 4 inch, and afterwards to 5-inch, 7-inch, and 9-inch; and I think that about two good shots for each charge and plate would be quite sufficient. I believe there is no theory on the subject, and all we can do is to ascertain the laws of penetration, by varying the diameter, the velocity, and weight of the shot and thickness of the plate; in order to discover how those four things are connected together, the obliquity must be determined by actual firing.

(The witness withdrew).

Adjourned to Wednesday next, at half-past two o'clock.

Wednesday, January 29th, 1868.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Chair.*

Major-General Sir WILLIAM GORDON, K.C.B., R.E.
Colonel ADYE, C.B., R.A.
Dr. PERCY, F.R.S.
Dr. POLE, F.R.S.

Captain HARRISON, R.A., *Secretary.*

Mr. ROBERT MALLET, F.R.S., examined.

1185. (*Chairman.*) I believe you have given considerable attention to the construction of shields for land defences?—I have given some attention to that subject.

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1186. You are prepared, as I understand, to give this Committee some practical information, which will assist them in their investigation?—I wish to do so.

1187. Have you seen the shield which has been referred to us specially to inquire into?—No, I have not.

1188. You were not present at any of the experiments that have been made at Shoeburyness against that shield?—No.

1189. Do you know its form of construction?—I do not.

1190. Will you be good enough to look at this drawing, and acquaint yourself with the form of construction that we have under consideration?—I see the construction from the drawing, and it appears to me, at the first glance, and speaking without minute examination, that the construction represented, embraces almost every property that is undesirable in an iron shield.

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1191. Will you be good enough to state what are the properties which you think an iron shield should possess, to perform the duty required of it, or will you first state what you consider the duty is, that an iron shield should be equal to performing?—I assume that now-a-days there will be no idea of adopting for embrasures in forts anything but muzzle-pivoting guns, and that therefore a large open embrasure, a large rectangular one, such as I see before me, becomes unnecessary. In my judgment it is not only unnecessary, but in every respect objectionable. I believe that every fort gun ought to be a muzzle-pivoting gun, and the aperture of the embrasure ought to be limited to a circular, or slightly elliptical form, and be very little larger than the muzzle of the gun. That being so, I think that the outline of the masonry that surrounds the shield, and which connects it with the embrasure, ought, in every fort, to be a circle, and not a rectangle; and perhaps, although I do not produce any design before you, nor do I wish the Committee to understand that what I am about to produce are designs; but, for the sake of clearer explanation, I may refer to these drawings [producing the same] which I exhibited before the Ordnance Select Committee, 10 or 11 years ago. These were the first designs for muzzle-pivoting guns brought before them; those designs also embraced specific constructions for the embrasures, and for shields for closing the same, though these were not necessarily connected with the muzzle-pivoting guns [explaining by the drawings]. I think that the form of the masonry that surrounds the iron shield should, as there shown, be circular in outline. I should say then that the main properties which the shield itself should possess are the following:—1. There should be no abrupt changes of form in the iron-work, but in the model before me, if I may illustrate by contraries as I go on, you have got no end of abrupt changes of form, you have masses of iron bolted and fastened together in all sorts of ways, and if any one part of such a structure was struck hard in any one place, the vibration given in the direction of the blow would thus become transformed into secondary waves in other and injurious directions. In a word, wherever there are sudden changes of form, or of scantling, or of both, there you are most sure to fracture the iron, by an impact which would not injure the same mass in a form of greater uniformity and symmetry. In the presence of so many mathematicians, it is quite unnecessary, I think, that I should go into molecular physics to show that that is so. 2. There should be no rigid connections between the iron and the stonework: that is to say, the stonework should merely form an ultimate support against which the iron should lie, so that the stonework shall prevent the blows on the front face driving the iron back. 3. There should be no absolutely rigid fastenings in the iron work itself. Now, the model before me appears to me to be defective, because it is a mass of rigid fastenings all through, which, therefore, are sure to be shaken off and driven into the rear if they are exposed to a heavy cannonade. Then, further, it appears to me that no shield that is to be effective in stopping an embrasure in masonry can be so unless you employ in some form a backing more compressible than the iron or stone; and I think you will best do that by using an alternation of materials such as I recommended in the designs I here refer to of more than 10 years ago. This is not only for the purpose of checking and absorbing the *vis viva* of the shot with less injury to the structure than if it were driven against a rigid mass of iron directly supported by, and bound into, a rigid mass of stone, but also with the view of widening the base of the reaction, in a direction contrary to that of the stroke of the shot. The drawings which I produce show a horizontal section: for example, this [pointing to the same] is a portion of a parapet, this being the interior of the casemate [describing]. Here are the two side walls of the casemate, which narrows from both sides in the direction of the embrasure in the centre of the front; here, [pointing to the drawing] is the circular aperture, and built into this [pointing to the drawing] is a large circular rabbate ring of iron, of which that is a section [pointing it out]; into that I drop a circular compound disc, so to say, of iron, in the centre of which is an aperture, circular or nearly so, sufficiently large to pass the muzzle of the gun, aim and fire through; several of these single discs may be superimposed, and between each should be placed a thin timber backing, or a backing of millboard to form the compound one. The drawings which I now produce were made with reference to the guns in use 11 years ago, viz., the 68-pounder smooth bore, or the 110-pounder Armstrong, and for those they were sufficient. But, of course, against the ponderous artillery which is now in use, the dimensions assigned then would be entirely inefficient, yet the principle remains the same. If you have got a circular embrasure of that character [pointing to the drawing], you may make the stone cheeks as you please in front, abruptly rounded off, tapered, or otherwise, as you like, and then you would stop it with one or several superposed plates of that kind [describing]. If such a circular plate is struck anywhere directly, the plate being of a circular form, will give the least amount of tendency to crack out to the other side, and will also have a much smaller tendency to recoil round a centre of spontaneous rotation; therefore it gives the least possible tendency to dislodge itself in a direction contrary to the stroke of the shot. If the plate is struck so that reaction does not produce any considerable tendency to recoil round a centre of rotation, and, so that it is almost wholly a forward blow upon it, the whole of the masonry round the rabbate ring will resist the forward impact of the shot together, in fact, it will be just like attempting to drive a penny piece through a circular hole, rather smaller than itself, and by which the piece is supported all round, so [describing]. Then the following advantages, as it appears to me, will be attained by this mode of construction:—The ironwork will be such that it can be repaired or renewed by putting in new parts of it, at night, and plates of that sort thus simply secured in place, could be lowered down over the top of the parapet, and could be brought and put in their places with perfect facility in a very short time, whereas in one of those complicated pieces of work that I see before me, if any material portion was once destroyed, it would be scarcely possible to renew it in face of an enemy, or to remove the damaged shield, and to put a new one together again, unless with the aid of skilled workmen, and then it would take them a long time. This kind of structure [pointing to the drawing] would give a battery a very much smaller exposed face of iron than any other structure of the kind can, and it appears to me to possess some advantages in the way of oblique

fire. It cannot be supposed, I think, that under the circumstances of the necessarily-scattered fire from shipping, for defence against which, I suppose, these shields are intended, many of the shot will strike directly normal to the face of the shield. If they strike obliquely a shield made on the principles I advocate, the smallest part of the aperture being on the outside, and the largest one inside, the chances are that the shot [pointing to the drawing] striking somewhere or other on the plate, and glancing off against the curvilinear faces of the stone-work, will be sent whirling round in such directions as to save both the muzzle of the gun, the ironwork, and the masonry from any very severe impacts. Then this mode of construction would give a facility in jointing the stones all round the embrasure in such a way that they shall all act in concert together. If you have a vertical face of construction of embrasure, you must cover it over by arching or corbelling at the top, and, in either case, there is but very little support given to the covering or lintel portion of the stonework by that of the jaws, because there is no sufficient weight or mass of masonry above the lintel; but if you have a circular aperture with the stones arranged as voussoirs all the way round, you can put the stones together so that no one stone can be driven back without carrying the others with it. These, crudely and roughly given, are the main points which, as it appears to me, are important; how far they may be applicable to the inquiry immediately before the Committee, I do not know. I do not know, for example, whether you have to conform to existing works, which will not admit of altering the embrasures from the present square forms into circular ones, or whether it would come within the scope of your inquiry to alter the existing masonry, so as to suit it for circular apertures, which I think would be the right direction to move in. There is one other point which I will venture to bring before the Committee, and it is this: I think that no sufficient research has been made by any nation in the world, up to the present time, as to what is the right sort of stone for forming the stonework of exposed faces of embrasure jaws, or of batteries of masonry generally. Granite, in my opinion, is certainly not the best material, although it seems to be one which is much relied upon, and I say so for this reason, that however hard and great its cohesion may be, it is vastly too brittle, and that has been found experimentally to be the case already. With respect to the quality of iron for armour-plates, it has been found, as the Committee knows, that a certain combination of rigidity and toughness will give the best resisting power in a plate; a certain balance in cohesion, density, and toughness will give the greatest resistance to impact in any other material such as stone, also; but no research has ever yet been made to apply the like principles to stone, or to determine what description of stone will give the greatest amount of resistance. However, certain I am, that there are stones in this island that would prove, under the stroke of shot, greatly more resistant than the best granite this or any European country can produce.

1192. (*Dr. Pole.*) Is there any material but trap that is better than granite?—Yes; I may illustrate that at once by an example. There is a bed of old Vesuvian lava that came down over Torre del Greco in the latter end of the seventeenth century; it is in appearance very like what the older class of geologists would have called clink-stone, and presents no appearance of fusion. That stone is so intensely tough and hard that a piece of it, not thicker than my hand can only, with the utmost difficulty, be broken off by a geological hammer as large as a man can wield by one hand. I believe that that stone, and all stones of an analogous character, would be found to be more resistant to shot than any granite. But there are innumerable varieties of stone, besides those known as absolutely fused trap, which seem to me to be better than granite. The mode of trial with respect to these which should be adopted, as appears to me, would certainly not be that very crude one which has been alone adopted as yet at Shoeburyness or at Woolwich, namely, firing at the stone; but the way, I think, would be to get some small specimens of the stones, and to determine the relative velocities at which fracture takes place with a given falling weight; at least, I think that is the best thing first to do. If you merely fired at these stones, you would either do nothing with them, or you would break them up, for there is no sliding-scale between; you could not thus determine anything with accuracy as to the physical properties of the stones in relation to each other.

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1193. Would there not be a difficulty in getting trap rock, or any of the other stones you have spoken of, at a small cost?—I think not; I may mention, as another example, the Scottish whinstone, and that was used several years ago for the base of a chimney at the Saw Mills in the dockyard at Woolwich. I do not know where it came from, but I was told it was from Scotland, and I judge merely from my memory of the look of it. I believe, however, that that stone would be a very much more resisting material than any granite to be found in our island, better even than the Mount Sorrel sienite, if that quality of red granite could be had in large blocks, as this stone can. I do not know how far it may be germain to your inquiry just to mention another circumstance that perhaps may have already occurred to some of the members of the Committee. The Russian General Majewski, in his investigations upon the trajectories of elongated projectiles in dense media, of which I gave a *resumé* in the *Engineer Journal*, some months ago, has shown that any elongated rifled projectile, in passing from air and penetrating a dense medium, diverges very rapidly, and curves in its course; that, in fact, the 4 lb. rifled projectile of the Russian field service, if fired into a butt of wood only 5 feet in thickness, turns right round, within that distance of penetration, from the direction in which it has been fired, and, I may add that the fact has been observed to occur in our own service. That being so, I think it is obvious that in any marine or other masonry fort, if you can interpose such a resisting material, so that the shot shall bury itself in it for a few feet in thickness before it reaches the final stopping face, you may turn the shot so far round as to make it almost innocuous. It seems to me that in many instances that might be practically brought to bear.

1194. (*Chairman.*) But what should you say in the case of shell?—In the case of shell, of course, you must take the chances of its explosion, but I think you might often keep the shell out by the front plate, unless it were an elongated shell at a high velocity, and then possibly you could not, for the difference in the penetrating power of heavy elongated shell and shot of equal calibre and equal projecting charge is very small indeed, when

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the range is small, but not so when the latter is large, or the fire oblique.

1195. (*Sir Wm. Gordon.*) The shield which you have described I presume is intended for casemates, or would you propose to make a similar one for an open battery?—I think that every open battery ought to have in the construction so much of a rudimentary casemate that every embrasure should be enclosed on the top for some feet to the rear, and be circular, and that between every pair of embrasures there should be carried back a buttress to the parapet—a sort of stone sloping traverse, in fact; for example, that [pointing to the drawing] is the face of the parapet, and here, between every pair of embrasures, I would have a buttress [explaining by a sketch]. I think the back of the parapet should, in fact, be like that [describing], and that all the stones in it should be so united both in the horizontal and vertical directions, that no one can be dislodged without more or less dislodging the others. Along with the advantage of the buttress I have mentioned, and, drawing into its horizontal arch the voussoirs of the arch stones that would go round the circular aperture, grafting them, as it were, into those arches upon a horizontal plane, you would also secure the advantages of a traverse here [describing], and you would also get a complete support for the parapet, with far less material and space than you could possibly do otherwise, and in that way you would cover, to a large extent, the men, without putting them into casemates.

1196. You would not have an earthen battery at all?—On the contrary, I would never put a stone into a battery if I could avoid it, because I think that earth is the legitimate material of which al batteries ought to be made.

1197. (*Chairman.*) But how would you form an arch with earth?—I only propose this plan where the conditions are such that you must use stone as in forts and sea defences, such, for example, as those at Spithead, where you are limited for space, and so are obliged to use masonry.

1198. (*Colonel Adye.*) Are the Committee to understand that the front of your shield is to be circular?—Yes.

1199. With a small hole for a muzzle-pivoting gun?—Quite so.

1200. How would you arrange your circular shield so as to give us about 12 feet in length and 8 feet in height, which is the size of shield that we want, to cover the gun and the men inside?—I see no difficulty whatever in it. This sketch will give a general idea of the thing; this is the extreme breadth of the casemate [explaining], and it is narrowed in to a certain width as these sides approach the shield, but still affording abundant space horizontally for training and working the gun.

1201. Have you calculated the width of that front as it must be?—Yes; for the 68-pounder and 110-pounder Armstrongs.

1202. What do you think will be the width of the iron to protect a 9-inch gun?—I have not yet designed shields for these large 9-inch or 13-inch guns, with embrasures of this form; but I shall be very happy, if the Committee think it worth while, to have a sketch made.

1203. (*Sir Wm. Gordon.*) What was the width of the front for the 68-pounder?—It was on this scale [explaining by the drawing]; it gives it there [pointing to the same] 8 feet for the 68-pounder.

1204. (*Colonel Adye.*) Eight feet would not be sufficient to protect not only the gun, but the gunners. We certainly want 12 feet in diameter, not 8?—I do not think you want 12 feet, and it does not necessarily follow that all that width must be got by using iron. It appears to me that the jaws should taper in, like that [describing] in the masonry.

1205. Would you build your shield into the masonry?—No; my shield would be perfectly independent of the masonry; it would be simply dropped into its place.

1206. But what would hold it there?—It would be held in in this way: If you will imagine a cylindrical hole in a wall, and that built into the hole at a certain distance from either face of the wall is an iron rabbate ring, properly and suitably secured into the stonework, all the way round, standing out from the masonry towards the centre of the aperture all round, as with a rabbate. Against the forward side of that rabbate I should place the circular plate or plates, and at its advanced side, placing between the face of the rabbate and the rear face of the plate a ring of wood or of millboard, or some other comparatively compressible backing; then I should place upon the front face of that plate another thickness of millboard, and supposing the plate to be 6 or 8 inches thick, then place a couple of inches of millboard over that, and put another iron plate over that. Through every one of these plates there would be a circular aperture sufficiently large to admit the muzzle of the gun to pass through.

1207. If I fired heavily at that, would not the shield fall down?—No; it cannot fall forward, unless by the granite or masonry in front of it being entirely dislocated and destroyed, because it will be secured in place in front by an iron ring made in segments, so as to be easily placed or removed or replaced, and which segments drop into a recess in the stonework all round and in front of the plate, and secure it in place as if by an external rabbate. Into the masonry, pieces of a peculiar form are dropped all round, one after the other, and then the ring exterior to these secures them all in their places, so that none of the pieces can fall out or forward until the masonry is completely destroyed. If the plates are destroyed and the masonry stands good, and you wish to restore the plates, all you would have to do would be to pass two or three men outside of the embrasure centre hole, to pull out these segment pieces one at a time, which can be done with perfect ease, and then tumble the smashed plates into the sea, lower down over the parapet new plates, and pass them back into their places, and secure them by restoring the segments to their places.

1208. It still appears to me that the shield will be supported by masonry, there being no other support, and that it will not be independent of masonry?—It will be supported by masonry undoubtedly, and so of course is not independent of the masonry, inasmuch as the fortification, considered as a whole, consists partly of masonry and partly of iron.

1209. But would it not be better to build an iron box that should be independent of the masonry?—I think not. I am satisfied that no iron box that can be made, if built directly into contact with granite masonry, as the shield shown me by the Committee is, will stand a heavy cannonade. If you build masonry, with bars and pieces projecting to various lengths into its mass, you build into it, in point of fact, a number of

crowbars; and every shot that is fired will act on them as on levers to dislocate the masonry.

1210. In your proposed iron shield, the masonry will be considerably recessed; the iron will not be flush with the masonry?—It will be so, but it is not necessarily recessed further than shall give such a thickness of masonry here [pointing to a drawing] in advance of the fixing segments as I may call them, that no stroke of a shot upon the shield [pointing to the drawing] shall break off any large piece of stone by its recoil, or in front of the fixing of segments. It will probably be not more than 3 or 4 feet recessed necessarily in any case [describing], at the very most, and may be much less.

1211. Then your shield would be very considerably recessed?—Yes, to the extent I have stated; but not necessarily more than in the form of shield I see on the table.

1212. Are you not aware that there is great objection to that, because, in the case of every shot that hit, the splinters would fly into the embrasure?—I do not consider that there is any objection of that sort. The principle that I go upon is, that I limit the aperture in the embrasure to nearly the mere size of the muzzle of the gun; and it is only when the gun has been fired and is withdrawn that splinters can, under any circumstances, enter. When the gun is withdrawn, and the gun being mounted, as I conceive it ought to be, the very withdrawal of the gun by recoil will close a pair of shutters, several inches if desirable in thickness, or a single shutter may drop in rear of the small aperture, and so prevent bits of iron or of stone coming in until the gun is again ready to be fired, and then the gun itself will prevent it.

1213. Practically, are there not great difficulties and objections to having embrasures so small as you propose, and are not shutters, while they afford very feeble protection, apt to get out of order?—That depends upon how they are made; I have never seen one made as it ought to be yet. The American stopper in the American turret looked a very simple affair, but it would have been made unworkable by a single blow from a heavy shot. If you bent it only half an inch, you jammed it in both the upper and lower pivots. I do not think a shutter quite effective as a defence against splinters at all difficult to produce.

1214. Have you ever made any experiments upon shields constructed of plates and millboard laid alternately, as you propose?—No; I recommended to the late Iron Plate Committee that a target should be made on that principle, and I know the Committee at the time were impressed with the importance of making some experiments upon it. They requested me to make a substantive design, which I submitted, and I believe that some attempt was made to get funds from the Admiralty to make a target by that design, but I do not know with what result. I believe that experiments were made at Shoeburyness by firing against a few small single plates of a given thickness, backed in both cases with an equal weight, but in one case of teak and in the other of millboard. The millboard there used was only the common millboard, as it was obtained from some papermakers in this country, and all the millboard of commerce, in this country, is largely adulterated with clay, so that the millboard used did not possess the elements of toughness and resisting power that really good millboard would have; but yet the result of the firing was to show that, weight for weight, millboard backing was better than teak, in the proportion for equal weight of backing, of seven to five. The experiment was on a very small scale, insufficient and incomplete; but such as it was it appeared to me to show the great importance of pursuing the investigation in that direction. I may say that I have now in my office specimens of millboard which were sent to me by certain manufacturers at Copenhagen, some of which are blocks of millboard 8 inches thick, in magnificent solid blocks; and the makers would undertake to supply it at 30*l.* per ton, which would be very little, if at all, dearer than teak backing. The application of iron and millboard, in place of timber backing, embraces other and different questions from the mere advantage in resistance of millboard as a backing superior to teak. Yet no attempt that I know of has been made to ascertain whether there would not be an enormous advantage in the incombustibility of millboard. By alternating several plates of a definite thickness of iron with pieces of millboard, or even wood, I believe a higher total resistance may be obtained than in any other way, weight for weight.

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1215. (*Dr. Pole.*) You have spoken of trap-rock as being very tough; but would it not be extremely expensive to get it, and to transport it?—That will naturally depend upon where it is to be found; but my belief is that when once the best material is found, you will find there is abundance of it, and probably it will be no more expensive than the granite you now use.

1216. I am aware that it is used largely where it can be found for metalling roads, for which purpose it is very good, and better than granite; but is it not found in very limited quantities, and generally in places where the means of removing it would be very expensive?—I do not think so. There are enormous quantities of trap-rock and other likely sorts of stone to be found: some in this country, and much more in Ireland and in Scotland; in England or Wales trap is scarcer, but abundance of it in Scotland. As Dr. Percy remarks, there are great quantities in the Midland and Northern coal districts.

1217. (*Sir William Gordon.*) Have you ever seen any masonry that was composed of large face stones of that material?—I have constructed bridges of trap-rock in the north of Ireland. The stones that we used were not very large, and we did not look for great size in them; but I know quarries in the north of Ireland in which basaltic blocks can be obtained almost of any size; and in Staffa there are pillars as wide as this table, of basalt, but I do not say that either of these would be the best material to use. Under the generic and rather loose names of basalt, trap rock, clinkstone, &c., there is a vast variety of rocks comprised, some of which would be much better than granite, and some of them a great deal worse; as regards size, if the stone be of the right quality, I think the larger the blocks the better, in any fortification.

1218. (*Dr. Pole.*) Would not the working of it be very expensive?—If you get the rock it will come out in blocks like granite, and why should it be more expensive?

1219. If it is tougher than granite, it would certainly be more difficult and expensive to work it?—The cost of working would be a little more, but I think that that would be a mere nothing. In this case it appears to me that expense ought

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to be entirely a secondary consideration; if you don't employ the right material, the expense, be it more or less, is thrown away.

1220. (*Colonel Adye.*) I am informed that experiments have been made by firing at large blocks of granite, and the result was to show that those large blocks were fractured immediately, and that masonry composed of smaller ones was found preferable; do you know anything of those experiments?—No one, I believe, who has ever seen a wall composed of granite in small blocks and one in large blocks can doubt, or, at least, anyone who has ever had any experience of the impact of shot, will be perfectly aware that one can put together a wall of rubble granite which will be, upon the whole, if well jointed and in good cementing material, less destroyed by a few rounds of heavy shot than a wall made of very large ashlar blocks of granite; and for this simple reason, that you have got the softer and tougher cementing material, which thus becomes, as it were, a buffer between block and block, and which, acting like the backing I advise, between the stone and the iron shield plates, deadens the blow, and confers upon the whole mass a certain amount of toughness which you do not have, with the large blocks united skin to skin. In the latter case, the first block that you split with an elongated shot, will drive the shot and fragments in like a wedge, which will dislocate all before it in every direction, but that wedge action is partly absorbed by the compression of the mortar in the other case.

1221. I thought you said that large blocks would be the best?—Yes, if you have the right material; but I do not think that that is true with so brittle a material as the granite employed. Suppose, for example, you built a fort of blocks of glass, or could make it of one single block of glass cast into the form; which would it be better to use, rubble blocks of the same glass, uniting them together with Portland cement, if that would stick to the glass, and packing them in tight, or, to make it of one single mass, if you could fuse it into one lump, and so make the fort of one piece of glass? The first blow on the single lump of glass would split the fort in all directions, but in the other case it would not be so, because the brittle material would be cemented together and held together with a cement tougher than the glass itself. If you take, however, the case of a material which is in the first instance suitably tough, then, I say, the larger the blocks are the better.

1222. (*Dr. Pole.*) Assuming that, rightly or wrongly, the conditions of these embrasures before us are such as to require a rectangular shape of about 12 feet by 8, with a port-hole like that in the Gibraltar shield, have you any suggestions to offer to the Committee as to what would be the best mode of construction for such a shield?—The model of the shield, which is on the table, I see now for the first time, and the drawing I have only just glanced at, but I adhere to the opinion I have already expressed that it appears to me to be an ill-constructed shield. I will not venture to criticise it in detail, or offer any suggestions to the Committee for its improvement, without having looked more maturely at the drawing, but if the Committee will enable me to do so, I shall be very happy, if the Committee think it worth while, to look at it more at leisure, and come before them again with some definite propositions.

1223. When you correct your evidence, you will be able to add anything that may occur to you?—(It having been suggested that the drawings produced before the Committee should be engraved for their Report, the witness said)—If I may suggest, would it not be better that I should have a substantive sketch made, embracing the principles that appear to me to be right, and applied so far as they can be, to an embrasure of the Gibraltar form, and also another of the form of embrasure and shield I advise, to be stopped with these circular plates, and both applied to guns of the present class, and consider these drawings as never having been produced before the Committee.

(*Chairman.*) Very well. In amending your evidence, you can furnish the Committee with such illustrations as you think fit.

7, *Westminster Chambers,*
Victoria Street, London, S.W.,
25th February, 1868.

Dear Sir,

I beg to transmit herewith three sheets of drawings, wherein I have had shown, in, I am sorry to say, a very rough manner, those alterations or additions to the Malta and Gibraltar shields, which I beg to suggest as capable of materially increasing the resistance of those shields at a comparatively small cost.

The alterations shown consist briefly in the interposing of two plates of compound millboard backing. One within the skin or interior plate, and the inside armour-plate, the other between the inside and outside or face armour-plate; and lengthening out all the bolts, so as to embrace the additional $6\frac{1}{4}$ inches thus added to the thickness of the shield. This is shown in sheets No. 1 and No. 2 of details.

The latter shows at full size the wrought-iron rabbate rings which are to bind the millboard backing and be placed between the existing plates around the embrasure, and also the rectangular ring bars which in like manner go between the armour and skin-plates to confine the backing at the outer edges or circumference of the shield. I should advise that the meeting edges or junctions of the armour-plates be rabbatted with semi-cylindrical channels (as shown on sheets No. 1 and 2), and a cylindrical bar of steel placed in each as a tongue between the armour-plates, so as to give each a hold upon the other when exposed to impact of shot. The $3\frac{1}{8}$-inch backing consists of blocks of millboard (or of hard wood, but I much prefer the millboard), each about 12 inches by 11 inches and packed into a reticulation of flat iron bars, each 3 inches by $\frac{5}{8}$-inch, halved into each other, as shown in sheet No. 3. This gives support and subdivision to the backing, and prevents possibility of fire spreading.

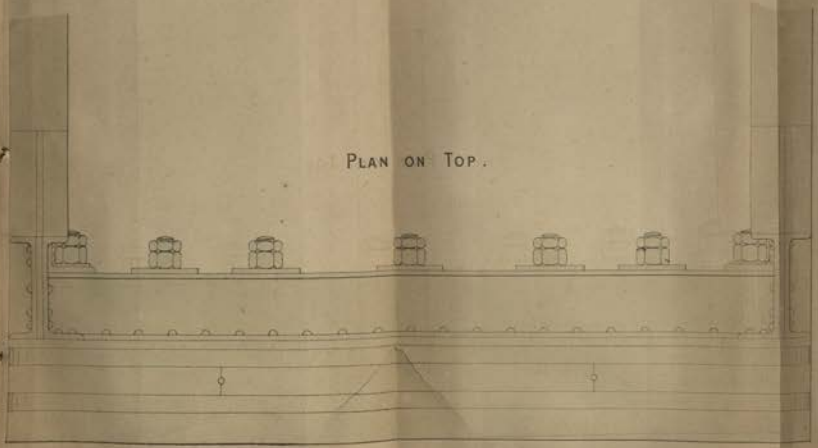
The millboard should be of the best quality, and not inferior to the specimen I send for inspection of the Committee herewith. I have made no estimate of the cost per shield of these alterations, but it would obviously be small, as all can be prepared at home and sent out, except the planing out the grooves in the edges of the armour-plates, and that can be easily done at Malta and Gibraltar by sending out one small planing machine suited to the purpose, needing no other foundation than the plate itself to be operated on, and driven by a little locomobile engine.

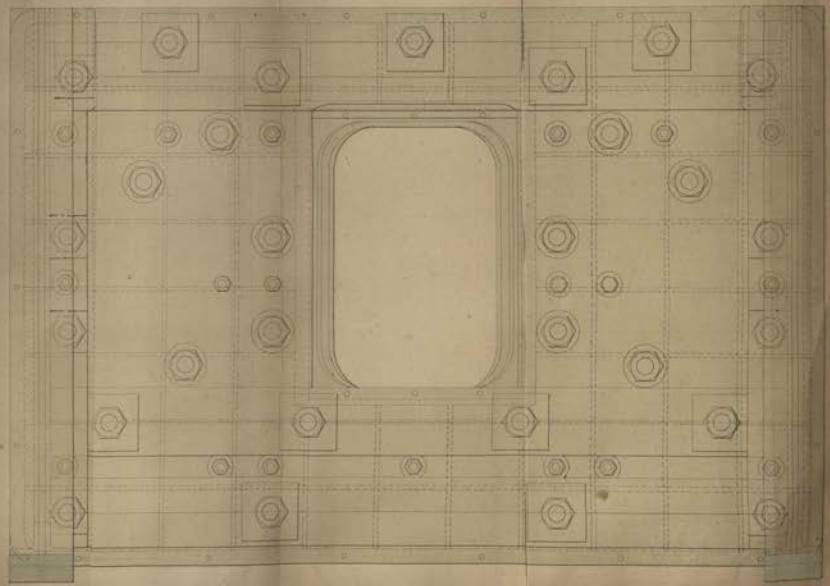
I have no doubt but that these simple alterations will *materially* increase the resistance and the safety to the men, of these shields; but if the Committee should not view a rather larger expenditure upon them unadvisable, I should further recommend an extension of this same method of improving them, which, if done, would largely add to the increment of strength.

This would be to place a 2-inch plate rolled in one piece, in front of the existing skin-plate, with a 3-inch backing between these, and then carry out in front just what I have above already proposed. The entire shield would then consist of the following, from within to the front—viz., 1·5-inch skin-plate, 3-inch backing,

PROPOSED ALTERATION OF GIBRALTAR AND MALTA SHIELDS.

PLAN ON TOP.



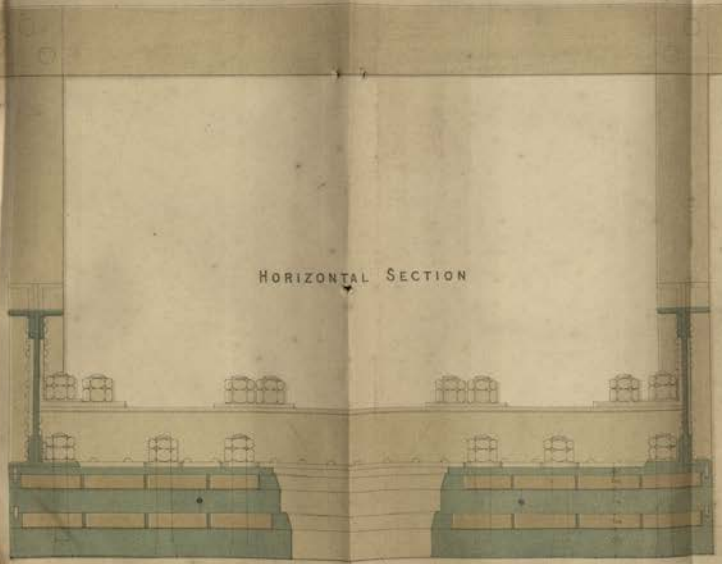


REAR ELEVATION.

Scale 1 Inch = 1 Foot.

Robert Mallet C.E.

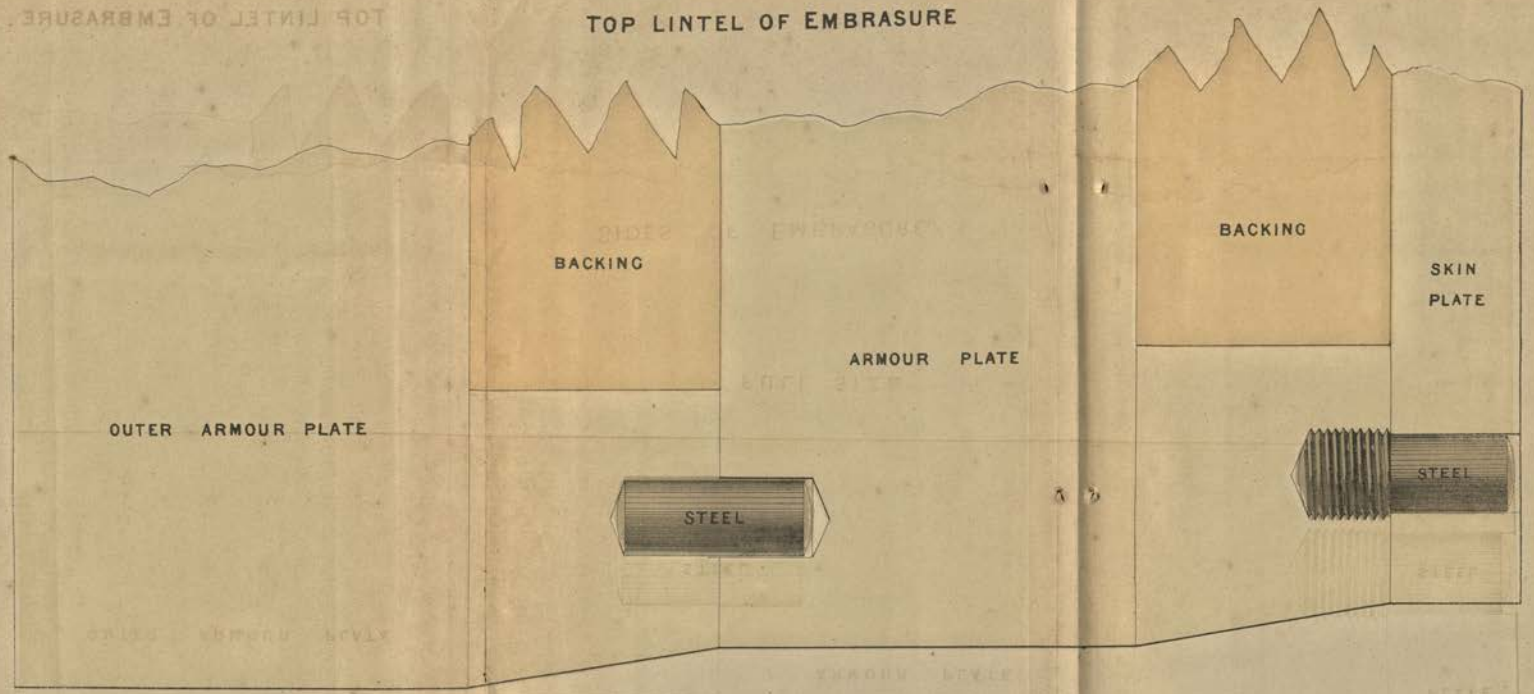
PROPOSED ALTERATION OF GIBRALTAR AND MALTA SHIELDS.



HORIZONTAL SECTION

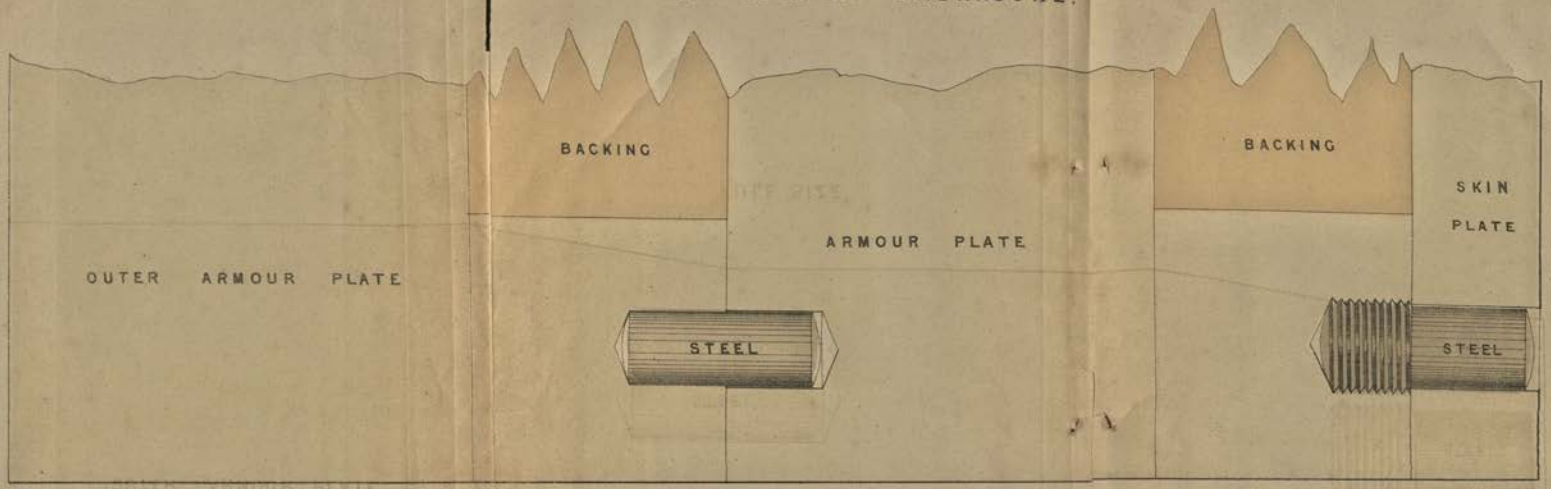
VERTICAL MID SECTION

Robert Mallet C.E.
25 July 1855


TOP LINTEL OF EMBRASURE
BACKING
BACKING
SKIN PLATE
ARMOUR PLATE
OUTER ARMOUR PLATE
STEEL
STEEL

FULL SIZE

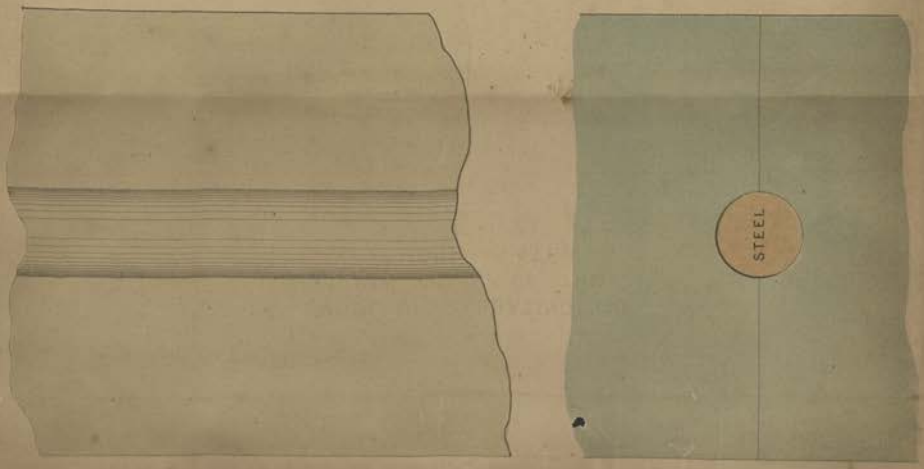
BOTTOM CILL OF EMBRASURE.

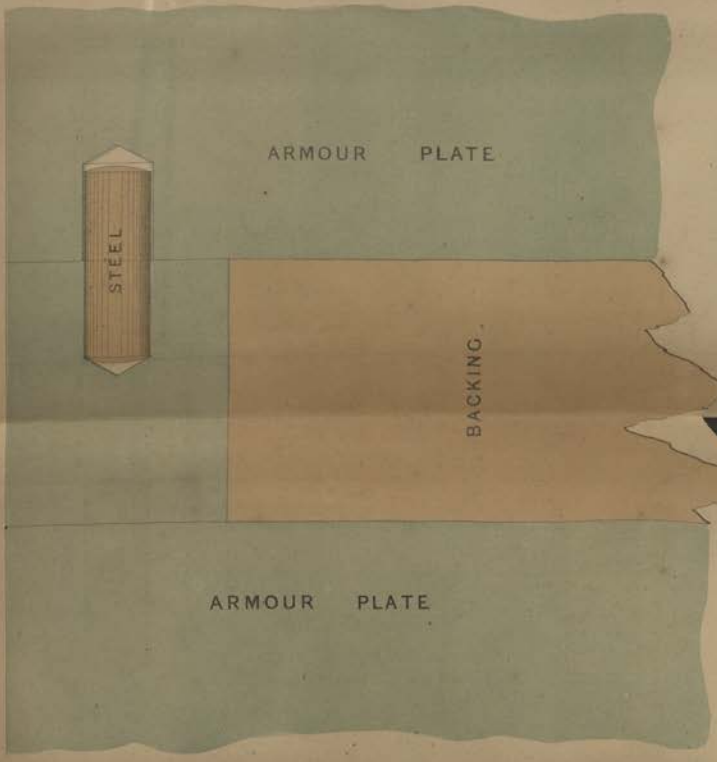


FULL SIZE

SIDES OF EMBRASURE.

MODE OF RABBATING THE
JUNCTIONS OF THE
ARMOUR PLATES.





2-inch plate (new), 3-inch backing, 5-inch plate, 3-inch backing, and 5·5 inch exterior plate, or 23 inches in all, in place of 18 inches as here proposed.

There are a few details which are tolerably evident from the drawing, and which I need not describe here at length. Should I have permission of the Committee I shall be glad, however, to appear before them and to describe the grounds upon which I form my opinion that these alterations would add considerably to the resistance of those shields, as well as to reply to any enquiries upon the subject, which, on consideration, the Committee might desire to make.

Mr. Robert Mallet, F.R.S.

29 Jan. 1868.

I have, &c.,
(Signed) ROBERT MALLET.

Captain Harrison, R.A.,
Secretary, Committee on Shields,
War Office.

Monday, 3rd February, 1868.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Chair.*

Major-General Sir WILLIAM GORDON, K.C.B., R.E.
Colonel ADYE, C.B., R.A.
Lieutenant-Colonel WARD, R.E.
Dr. PERCY, F.R.S.

Captain HARRISON, R.A., *Secretary.*

Mr. GEORGE WILSON, further examined.

Mr. G. Wilson.

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1224. (*Chairman.*) You appeared before this Committee on the 21st December last, and you stated that if the Committee should desire to see any designs after you had had time to prepare them, you would be very glad to submit them for consideration. Are you now prepared to submit those designs to the Committee, and to give them some explanation regarding them?—Yes; these are the designs (handing in the same), and I may say that there is no doubt in my mind that a solid plate, 12 feet by 8 feet 2, is the best that could be applied to a shield like that under the consideration of this Committee, if it could be made soundly, and at a cost that would justify its adoption.

1225. Of what thickness is the plate to be?—Of the thickness that might be found necessary to resist the heaviest guns which are likely to be fired at the shield. But looking at the difficulty of making one solid plate of such dimensions, and at its cost, I have endeavoured to reach as near as possible to a design that would give us some results approaching those likely to be derived from the use of one solid plate without going to the expense of such a plate.

1226. (*Colonel Adye.*) What is the proposed thickness of the dovetailed front plates?—They will be 8 inches thick, with a tongue or dovetail of 5 inches, making 13 inches altogether.

1227. You will use two plates?—Yes.

1228. (*Chairman.*) Will not those two plates cost a great deal of money?—Yes; they will cost much more than those in the present shield, and for this reason, that you will have a much greater weight of iron and a much stronger shield altogether.

1229. Do you propose, by new rollers, to roll roughly, and tongue and groove those plates?—Yes; I propose to roll the grooves straight and parallel, and then to open them out in the planing machine.

1230. I presume the rollers would be made for the purpose?—Yes.

1231. Would you propose to pile this plate uniformly in the furnace, and then bring it out, and by means of corrugations on the rollers to roll it down on one side; or do you propose to build up in the furnace, and pile it, and then erect certain bars in the furnace, to be rolled on by means of rollers, or would you make the rollers do all the work?—I would make the rollers do all the work.

1232. As I understand you, you propose to pile the plate, which, if it maintained its uniform thickness, would be a plate 13 inches thick?—Yes.

1233. The cost of making a plate with dovetails and with tongues on it, 13 inches thick in one place, and 8 in the groove, would be more costly, would it not, than if you had the same plate rolled with an uniform thickness of 13 inches?—No; it would be cheaper as a plate, although by the ton it would cost a little more when finished in the planing machine.

1234. In other words, you would produce a plate of an uniform thickness of 13 inches more cheaply than you could produce a plate of the form represented in the design which would be 13 inches thick only at certain points on its surface?—If your question applies to the plates as they are rolled, and goes no further than that, then the cost of the one per ton would be equal to the cost of the other, but the opening out of the dovetails would cause a little additional expense.

1235. A little only?—Yes; but if you consider that the plate of uniform thickness (13″ thick), would have to be drilled, and bolts and nuts supplied, the plate I propose to use would then be much cheaper.

1236. (*Colonel Ward.*) In rolling a plate of that shape, would all the iron be of the same density?—Yes.

1237. Would the iron in the grooves be as strong as the iron in the plain part of the plate?—Yes; I have no hesitation in saying that.

1238. (*Dr. Percy.*) What will be the thickness of the plate in the deepest part of the groove?—8 inches, or more if necessary, as the proportions in the designs shown can be varied at pleasure.

1239. (*Chairman.*) The result of former experience has been to show that all these notches are a source of considerable weakness?—No doubt all open joints are weak in a sense.

1240. (*Colonel Ward.*) Would not the notches be sheared by the effect of the shot?—No; if any such action existed the shearing strain would be at right angles to the direction of the grooves, and would, in my opinion, be entirely local.

1241. (*Chairman.*) Would you send out these

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shields for the purpose of being constructed, because I believe it is not very easy to move two masses of plates horizontally, which are bearing heavily on each other in inconvenient positions, so as to slide the one over the other, while, if they are upright, there is no great difficulty in adjusting them?—We propose, in our works, to put them together vertically.

1242. Do you mean that they will be so shipped to go to Gibraltar, for instance?—Yes; they may be shipped in that manner.

1243. Then, as I understand you, you would do away with one of the supposed advantages of having the shield made in sections, because one of the supposed advantages of having it made in sections, as against rolling into one solid plate, is, that you have but small masses to move and carry, and you have nothing to do afterwards but to put them together; but if the construction is to take place at the works, the question would be whether it would not be advisable to apply heat and put them under the rollers?—I would think that the front part of the shield, being in one solid mass could not be objectionable, since it is proposed to use guns weighing 20 to 30 tons each, and there would be no greater difficulty in moving a mass of iron of a similar weight.

1244. As I understand you, this shield is to be put together at your works?—Yes.

1245. Could you not put together the same mass of iron at the works, by means of the welding process, rather than by tongueing and grooving?—We possibly think it more difficult to do this than we should absolutely find it to be, but it would be a very costly process, compared with the one represented in these designs.

1246. (*Colonel Ward.*) What would be the cost of a shield made according to that design?—As it stands now, I think it would cost a little less than 1,500*l.*

1247. (*Chairman.*) Do you mean ready for delivery?—Yes.

1248. What would be the cost of rolling one plate of the same thickness?—In that case the armour-plate itself would cost more than the proposed shield, upwards of 1,500*l.*

1249. That is to say, a plate of the dimensions you have described?—Yes.

1250. (*Dr. Percy.*) Have you any mill at the present time that would do that?—No.

1251. (*Chairman.*) Do you give that answer with reference to a few first samples, or with reference to the price in the trade?—I base my calculation on a considerable number being made.

1252. (*Dr. Percy.*) Suppose a contract was put before you to make a plate in one piece, 15 inches thick, no matter what the cost might be, could you do it or not?—I could after we had put down the special plant required.

1253. (*Chairman.*) Supposing that to be done, would you pile the whole plate and cut the port-hole out afterwards, or leave a hole?—I should pile the whole plate, and cut the port-hole out afterwards.

1254. (*Colonel Adye.*) In your design No. 6A do you screw the bolt into the back plate?—We screw it in. The 8″ and 6′ armour-plates would be screwed into the bars as well as into each other.

1255. You do not use nuts and screws, but you screw into the back plate?—Yes.

1256. With conical head?—Yes.

1257. How would you get them out?—I presume that would never be wanted.

1258. (*Chairman.*) Can you state what the proximate cost of that would be?—It would cost about 1,500*l.*, or about the same amount as the other.

1259. (*Colonel Ward.*) You could not turn out a shield for 1,000*l.*?—Not of the strength you require it.

1260. (*Chairman.*) What is the thickness of the two armour-plates in design No. 6A?—They are together 14 inches thick, and the shield is 22 inches thick at the parts covered by the 8-inch bars.

1261. (*Colonel Adye.*) What is the thickness of this back plate?—There are 8 and 6 and 8 inches, making together 22 inches.

1262. (*Colonel Ward.*) Is there no danger, when the target is fired at at an angle, and the dividing line of the front plates is vertical, of these plates being separated?—All the bolts would resist any action of that kind. I presume they are to be protected by masonry at each end, and that would prevent the sliding of the plates.

1263. (*Chairman.*) What would be the diameter of the bolts you would use in a shield constructed according to that design?—They would most of them be 3 inches in diameter; there are some small ones which would be 2 inches thick.

1264. (*Colonel Ward.*) Is it necessary, in your opinion, to fasten the front and the back plates together by bolts at all: do you think it adds much to the strength of the shield?—I think they would otherwise be liable to fall forward.

1265. If you had one plate in front, and the back plates fastened to it thus [describing], might not the shield be constructed without bolts?—The plates might be held in their places by clip plates of special sections of iron.

1266. (*Chairman.*) Did you witness the experimental firing at Mr. Scott Russell's target in which no bolts were used?—No.

1267. Have you sufficiently explained the designs which you have submitted to the Committee?—I think so. What I have stated embodies nearly every point that I wish to bring before the Committee.

1268. (*Colonel Adye.*) With regard to the first plan, that of tongueing and grooving, that will be composed, I think, of 8 inches, 5 inches, and 5 inches, the total being 18?—Yes.

1269. As I understood your design, it is proposed that the front plate shall be joined to the back plate by tongueing and grooving?—Yes.

1270. The cost of the front plate would be rather more than the cost of a 13-inch plate?—No; it would be cheaper as a plate, although weight for weight it would cost a little more when dovetailed.

1271. The back plate would cost rather more, as I understood you, than a 10-inch solid plate?—Yes; weight for weight it would cost a little more when dovetailed, but it would be cheaper as a plate.

1272. Would it not be cheaper, and a stronger mode of construction, to have a plain 13-inch plate in front and then a 10-inch plate behind bolted together?—No; that would be much more costly, for you would then have 23 inches thickness of armour; whereas I propose to use only 18 inches. In the next place, it would necessitate the use of some fastenings in the shape of bolts, and that would involve the expense of drilling holes and providing those bolts, which alone would be more costly than the planing of the grooves, as shown in the drawings.

1273. The front plate you have already said would, as tongued and grooved, cost rather more

than a 13-inch plate, and the back one rather more than a 10-inch plate; but a plain 10-inch plate and a plain 13-inch plate would be cheaper, leaving out the bolts for one moment, would they not?—Leaving out the question of fastenings, a 13-inch and a 10-inch armour-plate, tongued and grooved as proposed, would cost more *per ton* than plain plates of the same thicknesses; but as plates *per se* they would be cheaper.

1274. The front plate would cost as much as a solid 13-inch plate?—No, it would be cheaper taking it as a rolled plate, inasmuch as it weighs less than a solid 13-inch plate, but taking it as a plate finished, with the grooves planed out, and ready to fit into one another, it would be rather more expensive per ton than a plain 13-inch plate. But to fasten a plain 13-inch plate, you must drill holes into it and provide bolts for it; therefore the proposed shield would be a cheaper structure than a shield with a 13-inch solid plate and a 5-inch solid plate behind it, fastened with bolts and nuts.

1275. If you prepare your furnaces for a 13-inch solid plate, how do you proceed after tongueing and grooving; can you afford to charge for it by weight, you having already prepared rolls for 13 inches?—The soles are prepared so as to roll some portions of the plate 13 inches, and other parts 8 inches in thickness.

1276. And yet you would charge it by weight as if it was only an 8-inch plate?—No; it would be about a 10½-inch plate.

1277. Do you not think that great difficulty would be found in repairing that shield if it happened to be damaged, to a certain extent, by shot, and more than if it was bolted?—No, I think not; because, after all, if the shield should be damaged, in either case the armour-plates will have to be removed, and new ones put up.

1278. Would the cost of a solid plate 12 feet by 8, and say 12 inches thick, be very great, after the first starting?—The cost of such a plate would be considerably more than the present 12-inch plates of moderate sizes.

1279. Of what width should you be able to make a 12-inch plate now?—We can roll such a plate up to a width of 5 feet.

1280. Would it be very much more expensive if you went beyond that?—Yes, as you advance in width the cost advances.

1281. Have you any idea of the increased amount per ton?—I could only state the price widely; it would be from 50*l.* to 60*l.* per ton.

1282. Take a 12-inch plate, 5 feet wide, what is that worth per ton?—It is worth 40*l.* per ton.

1283. And the other is only worth 50*l.* per ton?—The other is worth between 50*l.* and 60*l.* per ton.

1284. As I understand you, your main object in proposing tongueing and grooving is to get rid of the bolts?—Yes; and to approach, as nearly as possible, to a solid plate 8 feet 2 inches in width, without incurring the great expense of it.

1285. (*Colonel Ward.*) In the shield that you propose to make with two plates and bars behind, what would be the thicknesses of the two plates?—The first would be 8 inches, the intermediate 6 inches, and then the bars behind 8 inches.

1286. As I understand, you intend to fasten those two plates together with bolts?—I intend to fasten them by screws.

1287. Would it be possible to hold them together by having a horizontal clamp at the top and bottom?—Yes, I should say that that could be done; in fact, at one time I prepared designs with vertical plates for that purpose, and intending to introduce the chilled iron that was mentioned some time ago, but the vertical plates caused me to abandon it.

1288. Will you be kind enough to explain a little further the reason why you abandoned them?—The design I refer to represented a system of plates rolled with grooves vertically, and these grooves were intended to be filled up with chilled cast-iron like the Palliser shot, and the mode of fastening them was by clips of special rolled sections of iron, holding the plate top and bottom.

1289. Could you not fasten them with a horizontal band, going right round, and without going over the top, just a broad band in front going round the edges, and also along the back, would not such a plan be practicable?—Yes; but it would be very expensive forging.

1290. Do you think it would be cheaper to put a piece on the top?—Yes, I think so; and I think so because you would have to recess the top to give that band a bearing, and the plates a hold upon it.

1291. You need not recess the top, but recess the side by taking a little off the plate; that would be sufficient?—You might do so.

1292. I want you to tell us how you think such a band would stand under shot. Could not you put it on hot like a tire on to a wheel?—Yes; it could be put on.

1293. Without any expensive forging or fixing?—The forging required would be expensive.

1294. Would it enable you to do away with bolts?—Yes, it might.

1295. You might rest it against the strut without any further bolting than would be necessary to fastening it to the strut?—Bolts would be required to keep the strut up to the back.

1296. But no bolts would be required to fasten the plates to each other?—No.

1297. Can you tell us what the cost of a shield of this kind would be?—I shall be very glad to inform you when I have had time to consider it.

1298. (*Chairman.*) One of the witnesses who has appeared before us has given us some information as to the comparative value of iron armour-plates of different sizes, weights, and thickness, and he seemed to think that, taking the average trade price at this time of an ordinary plate of 5, 6, or 7 inches, and of such a thickness as you produce, you could state, with tolerable accuracy, what increase of cost each additional inch in thickness, or foot in width, would be likely to cause. Have you any rule which will enable you to state to the Committee the probable additional cost to the country of making these shields of very thick plates of iron?—For the manufacturer to do complete justice to the quality of the iron, and also to himself, the advance in price of plates of thicknesses beyond 7 inches would be about in the following proportion. I mean taking it as a pure question of cost, and maintaining the same quality throughout. If a 7-inch armour-plate is worth 30*l.* a ton, an 8-inch plate is worth 31*l.* a ton, a 9-inch plate is worth 2*l.* more than an 8-inch plate, and a 10-inch plate is worth 36*l.* per ton.

1299. Up to what thickness would that progressive scale of increase go?—As far as we can go.

1300. (*Dr. Percy.*) How much would it be per additional inch of thickness beyond a given thickness?—I should say that for every additional inch of thickness the plates would be worth 3*l.* a ton extra beyond plates 10 inches thick.

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1301. What is the greatest thickness that you would be prepared to tender for without changing the machinery? — We can make 15-inch plates.

1302. Of good quality?—Yes.

1303. Of what width?—About 4 feet.

1304. (*Chairman.*) If you increase the width of the plates without taking into account the element of thickness, up to what increased width could you make a fair and reasonable increase in the width of the rollers, and in doing so, not for an experimental plate, but a plate for service, what increased charge per ton would be incurred by increasing the width beyond a given ratio?—It is very difficult to state that, and for this reason, that the main element in the question is, the total weight. If the plate were exceedingly thick, it must be made so much narrower, in order to keep within the limits of weight. We can roll plates at the present time 5 feet 6 inches wide by 4½ and 5 inches thick, at the same cost as a 7-inch plate 4 feet 6 wide, the weight being about the same in both cases.

1305. You are perhaps not able to make any approximate statement, or one which would show the ratio of increase in cost which was due to the increase of width?—The only rule upon which we could establish a calculation for that is by taking the superficial area of the plate in connection with its width and weight.

306. (*Dr. Percy.*) Suppose you took the double of 4 feet, and made it 8 feet?—Then the price per ton would depend upon the superficial area and weight; in fact, it involves a question of weight, the weight of the material you have to deal with, as well as width.

1307. Supposing wide rollers to be an advantage, I suppose you do not apprehend, excepting upon the question of weight, any difficulty in increasing the width of a plate, if its area is the same, say a plate 8 feet wide and 8 feet long; a square of 8 feet would not cost more than a plate of 4 feet, twice that length?—Yes; it would cost more in that case.

1308. Much more?—Yes; considerably more.

1309. I believe you can roll a plate 4 feet wide by 16 feet long?—Yes; we do that.

1310. Instead of rolling a plate 4 feet wide by 16 feet long, or, say, an ordinary plate 5 or 6 inches in thickness, and 4 feet wide by 16 feet long, supposing that your rollers were ready, what would be the cost of a plate 8 feet long and 8 feet wide, which would represent the same area?—The cost must advance considerably, because we would have greater waste throughout every process, from the mould upwards, in addition to the greater outlay of capital required, the increased consumption of fuel, and the enhanced risk of dealing with such masses of iron at a welding heat.

1311. Supposing you made plates 12 feet long, 4 feet wide, and 8 inches thick, and we wanted one, say, 5 feet wide, and the same length and thickness, what would be the additional cost per ton for that increase of width?—I should charge nothing extra for 5 feet.

1312. Would you charge nothing extra for 6 feet if there was a large demand for these plates, and it was not a mere experimental plate?—I should charge 2*l.* a ton extra for that additional width.

1313. What should you charge additional up to 8 feet?—I cannot speak with certainty to the cost beyond 6 feet.

1314. That is for 2 feet extra?—Yes; beyond 6 feet in width and for heavy plates it is possible we may find great practical difficulties to be overcome in the mode of heating such plates, and in the construction of the furnace; it is, therefore, a difficult matter to give the Committee a reliable answer as to the exact cost of such wide and heavy plates as are now spoken of.

1315. (*Chairman.*) A previous witness was asked whether he could make a plate 12 feet by 8 in one piece; could you do so?—Yes; I have no hesitation in saying that we could do it, if we had the machinery.

1316. What would be the estimated cost of such a plate per ton?—I gave the wide range of from 50*l.* to 60*l.* a ton.

1317. (*Colonel Adye.*) Is there not a difficulty in increasing the width of the armour-plates, and does it not lie in the fact that you have to alter the machinery and the furnaces, although you can now make plates long or short, thick or thin, in the same furnaces?—Yes.

1318. If you came to increase the width of the plates, you must alter the furnaces?—Yes.

1319. Therefore that would be the great cost in the first instance; but do you think you would have any difficulty if you could once alter the furnaces?—I have no doubt that in the first place we should meet with great difficulties, but I have not the slightest doubt that we could overcome them. The question of heating a plate of such an immense superficial area and thickness—that is to say, getting it thoroughly heated in the centre without burning the edges—is a very difficult one, but the question of cost does not alone depend upon the alteration of the furnace.

1320. But the superficial area of a plate, 16 feet long by 4 feet wide, is not greater than one of 8 feet long and 8 feet wide?—The plate you mention, when in the furnace, would probably be 4 feet 2 inches or 4 feet 3 inches wide, whereas an 8 feet plate would be 8 feet 3 inches or 8 feet 4 inches wide, and the heating of such a wide plate would, I anticipate, be a matter of difficulty to ensure a perfect weld throughout

1321. I see that you do not advocate an elastic backing, or any support in the nature of end-on stringers, but you rely entirely on a solid mass of iron?—Yes.

1322. Do you consider, upon the whole, that that is the best plan to pursue for land defences, both with regard to strength and cost?—Yes, I do, and especially as to durability.

1323. You reject entirely the use of end-on supports?—Yes, I do. I look upon it as a question of depth of armour.

1324. (*Colonel Ward.*) How would you propose to repair the existing shield at a reasonable cost, and without making great alterations?—I have considered that question; but if you will allow me, I would rather explain my views by a drawing which I will send to the Committee.

1325. (*Chairman.*) Can you state generally the principle that you would recommend, whether by changing the front plate for a thicker one, or the hinder plate for a thicker one, or making a different arrangement of the materials, or by using larger bolts?—In order to preserve every part of the shield you have now got, I would put on 9-inch plates in half the quantity left, and the front 5½-inch plates replaced by the 9-inch, I would put in the remaining half, between the skin plate and the intermediate vertical 5-inch plates.

1326. (*Colonel Adye.*) Your proposal would go to lengthening the bolts over the whole area or

the shield?—Yes; but I would make use of the present nuts and washer plates.

1327. (*Chairman.*) Will you state whether you would prefer that plan to substituting an entirely new front plate of considerably greater thickness, which would also entail new bolts, leaving the rest of the structure the same, and putting the present front plate in the position of other plates in other shields?—I think you would have a better shield by putting a thicker plate in front.

1328. Can you give the Committee any idea of the cost of substituting a front plate of 9 inches, and what might be fairly estimated as the value of the 5½-inch plate, supposing it to be applied to other shields?—If you will allow me, I will go into that calculation closely, and report the result to the Committee.

1329. To some persons, one of the serious defects of a shield of this construction seems to be that a blow in front jars out in the rear, and that the bolts or fragments of iron are scattered amongst those who are intended to be protected. Can you suggest any cheap mode of erecting a screen which, without being capable of resisting shot or shell, would save those whom it is intended to protect from a shower of such missiles?—The best thing that I have seen in that way is the mode adopted on board the American steamers with the wrought-iron turrets. They have a very thick wadding, sewn up in some way in canvas, perhaps about 15 inches thick. It is hung on by hooks on the top of the turret, and is fastened at the bottom also; and this seems to afford perfect protection to the men. It is taken off when they are not in action. *Mr. G. Wilson.* 3 Feb. 1868.

1330. That appears to be on the same principle as the rope mantlet which has been used?—Yes.

1331. Do you not think that a thin iron screen, fastened top and bottom, would do well to catch the broken fragments?—I think it would interfere with the training of the gun.

1332. Is it your opinion that the American plan has proved satisfactory?—Yes. An officer told me, who had been in an engagement, that the men were protected, and that not a man was hurt on board his vessel by the breaking off of the nuts in the turrets of the ship.

1333. Do you happen to know whether there were any bolts broken off during the engagement?—Yes.

1334. And they were actually stopped by the contrivance you have mentioned?—Yes.

(The witness withdrew.)

Wednesday, 5th February, 1868.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *in the Chair.*

Major-General Sir WILLIAM GORDON, K.C.B., R.E.
Colonel ADYE, C.B., R.A.
Lieut.-Colonel E. W. WARD, R.E.
Dr. PERCY, F.R.S.

Captain HARRISON, R.A., *Secretary.*

Mr. CHARLES WILLIAM LANCASTER further examined.

1335. (*Chairman.*) I believe you have now prepared a drawing, which you desire to explain to the Committee?—Yes; this drawing [producing the same] has been prepared with reference to the enquiry that was made by Dr. Percy as to whether the shield already made could be strengthened, and if so, at what cost. If the Committee will permit me to explain, I have gone upon this supposition, that the shields are out in various foreign parts, and it is not desirable, if it is possible to avoid it, to bring them home, for reconstruction; and what I have done here, as shown in the drawing, has been with the view of sending out to the different stations certain plus parts which might without difficulty be applied there; and, if the Committee should think it worth a trial, I will guarantee that it will enormously strengthen the targets. I have also proceeded on another distinct, but, I think, equally logical, proposition, which is this—I believe that given the *vis viva,* or the work done by a projectile, the target that is struck should represent, by its *vis inertia,* a certain definite proportion to the work done upon the target, believing that, if the target is too light in general weight, or in total weight, either the target will be soon destroyed, or the structure, into whatever it may be put, will be driven back, or destroyed, and the target itself rendered loose. Therefore, I believe, setting aside the strengthening of the target, which I believe I shall be able to convince you can be done, you will gain a great point in having greater weight than before in the target itself. I have lettered and numbered every portion of this drawing, which I will now endeavour to explain to the Committee. The first part, A, consists of a sole plate, passing from the front to the extreme rear of the target, and receiving within it that cross-piece at the back [describing], a portion of sole plate being planed out to receive it. This sole plate will also form a level for the floor, and that is 10 feet 3 inches by 6 feet, and by 5,—that is, it is 10 feet 3 long, 6 feet wide, and 5 inches thick; it is recessed at this point [describing], and at that point [describing], to receive the whole of the armour-plating, a 6-inch plate is put in front of those two plates, which I put at the back, so that a blow given to any portion in front of that structure would be strutted and received into that sole plate, and there would be no tendency to crack the front of the target, and break the girders behind. B is an armour-plate 8 feet 2, by 6 feet 10, and 6 inches. This is B [pointing to the same], and the object of that armour-plate, B, is to strengthen the immediate vicinity of the port-hole, where, it will be remembered, a shot struck at the trial. There is a joint there in the structure, and, by this arrangement, I cover up that joint just by the port-hole, and strengthen the target greatly by a *Mr. Charles W. Lancaster* 5 Feb. 1868

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6-inch plate; it is one whole plate, with an embrasure cut out in the centre. This plate [pointing to the drawing] will be 6 feet 10. We can roll them up to 7 feet 6. I should also mention to the Committee that the sole plate, A, embraces at this point [describing] the 6-inch armour-plate, put in vertically, and it is clipped round by a groove, to carry it, so that, when struck there [describing], there is no buckling at the bottom, or if there is any, it will all come from the top. Now, C is the top plate, to strengthen the port-hole, 11 feet by 18 inches, by 4. It runs from here to there [describing] behind; this is the front, and I am now taking the back view. C runs from there right across; D also runs right across, and they are two plates to strengthen the girders. I should explain that the object of having that plate, B, behind is this—the Committee will be aware that in the trials made at Shoeburyness, when the port was struck, the girders were cracked, but by putting plate B right across from side to side, and keying it in at the bottom, it will effect just the same purpose as the man does who holds the dolly behind the rivet, in riveting, and this will prevent, to a great degree, the giving way of the H girders, especially when supported by the two very important features E and F. They are curved plates, the whole width, and they are formed with that curve, in order to support this part [pointing to the drawing], which was found before to be radically weak, and there is, I believe, only that way of doing it. Supposing, as it at first occurred to me, that we attempted to fill up, by a series of short lengths vertically of these H girders behind, and then put a flat plate on the top, there would still be this difficulty to contend with—that, in order to train the gun to the required angle, it would be necessary to retire that back plate; supporting it in that manner, you still have the edges of the port-hole radically weak; but, by using this front plate [pointing to the drawing], you can bring this part of it, which is 8 feet 2 by 3 feet 10, and by 4 inches in vertical height when bent to the required curve, and, bringing it into that curve, you have, as it were, an arch 4 inches thick, pressed up against the inside plate, and I am perfectly sure, if the Committee thought fit to have a trial made of it, they would find they had added such an enormous amount of resisting power to the shield, that it really would give, as I believe, every satisfaction.

1336. (*Dr. Percy.*) Is this plate [pointing to the drawing] of uniform thickness throughout?—This is of uniform thickness—4 inches thick; it is precisely the same throughout; it is tied in here, and it fits into the sole plate.

1337. (*Chairman.*) As I understand you, you propose to add 10 inches of iron to the shield?—Yes; in some parts there will be more than 10 inches of iron, just over here [pointing to the drawing], you will have more than 10 inches of iron, but you are compelled to do that from the small strip of iron you have there [pointing to the drawing]. If a powerful shot or shell struck it there [describing], it would break it right in two.

1338. (*Colonel Adye.*) I see that this [pointing to the drawing] does not come up flush?—It comes as close as it is possible to be for the training of the gun. As you increase the thickness here [describing], you require to retire a little from the port hole, or you would not obtain the same angle for training; that is the extreme limit to which you can approach the edge of the port-hole, owing to the angle of training required for the gun. I may mention that all the old parts are uncoloured, and all the new parts are coloured, so that the Committee will be able to see exactly what I mean.

1339. (*Dr. Percy.*) As I understand, the structure you have been describing to the Committee is wholly of iron?—Yes; no other material is used.

1340. (*Chairman.*) Can you state what will be the additional cost?—The cost of it would be, looking at the price you paid for the old structure, and taking into account the cost of planing and bending, within a few pounds of 850*l.*

1341. (*Dr. Percy.*) For each shield?—Yes; but I cannot send you in a formal letter of the prices until I can send a tracing to the Millwall Works; the Committee can send it anywhere else they please. But I will obtain from the Millwall Works a precise estimate;* here are the total weights stated in round numbers, and they amount to 21 tons 10 cwt. 3 qrs. gross weight of armour-plating, without the work of planing and recessing out. Then there will be required 1 ton 9 cwt. 2 qrs. 11 lbs. of 4-inch bolts. I should use your own bolt-holes. The bolts are made up to 4 inches.

1342. (*Colonel Ward.*) By adding on that 6-inch plate, would you not diminish the space for training the gun?—No; the 6 inches would be so arranged as not to produce that effect. I desire, if the Committee will permit me, to lay particular stress on this important point, that, when the drawing is carefully examined, they will find, I think, that no one part is added that cannot be readily sent out fully prepared to any foreign station, and, by the aid of the workmen to be found there, soon erected in its place.

1343. Do you consider that plate A is essential?—Absolutely essential; that is one of the main foundations of the whole plan. Without that you would have this [pointing to the drawing] giving in. That was one of the fundamental faults of the targets, and this is essential because there was not a sole plate in this way, horizontally; had there been a sole plate in that way in the original design, this would not have been necessary; but, failing a broad sole plate, I am obliged to arrange it in that way.

1344. That would not be sufficient to build the whole framework upon?—No; you want to lock this target in front, and you want to lock it behind. This will be [pointing to the drawing] absolutely to your level, the gun will train upon it, and a very capital place it will be to put your pivoting point on in iron. This is taken exactly from your drawing—that is the level. This [pointing to the drawing] shows a tracing of these side-bars, and these coloured portions are plates riveted on to this [describing], but this is the original support. Now, with regard to the trials made at Shoeburyness, after several blows had been struck, the bolts began to shear, and to prevent that, I merely fit a a plate in, jointed against this piece across [describing], butting up against there, and against there, and being bolted together. That will add enormously to the power of that backing.

1345. (*Chairman.*) But you will still leave the bolts and nuts exposed?—Yes, I shall leave them exposed.

1346. Was it you who suggested a tapping into the rear plate, so as to avoid the necessity for nuts?—No.

1347. Have you at all considered that point?—No, I have not. There is a target down at Shoebury now, and they had a thin plate,

* The tender states that the cost "for the whole number" would be £849 per shield, and four months will be required for the completion of the work.—A.H.

some quarter of an inch, covering over the nuts, and everything already erected, but it was never experimented upon; if that is found efficient it would be very easy to add it to that.

1348. Another suggestion, which has been brought before the Committee, is to have a thick plate in the rear, tapped, so that the bolts should be screwed into it, and so using no nuts, have you considered that point?—If you were to do that, or to do it at all, you must have a very loose fit, in those bolts, or you could not turn them round into it—that is, you could not turn them round into this thick plate [pointing to the drawing], and they must fit very loosely.

1349. That has already been shown to be advantageous for the purpose of avoiding shearing?—Yes, in the shields, as constructed.

1350. (*Colonel Adye.*) Could you not have them made with a square head, so as to screw in, and then cut it off?—I should doubt it: but that is a point which has not occurred to me; it can only be determined by experiment. I should rather doubt it. I have mentioned in the drawing that I should prefer Baskcombe's washers being used—I mean such as are used in the Navy, with a sort of case round the washer.

1351. (*Chairman.*) Can you state what the exact cost of your structure would be?—I am sure it will not exceed 850*l.* Here are all the weights. The Committee know that their target was made for 32*l.* a-ton. We know that the cost of the Palliser bolts is 60*l.*, and this, if Palliser bolts are used, will cost 90*l.* If made of the Admiralty pattern, they will cost about 40*l.* a-ton. I have gone into the cost of planing, and, having made a liberal allowance, it will not cost, I think, more than I have stated.

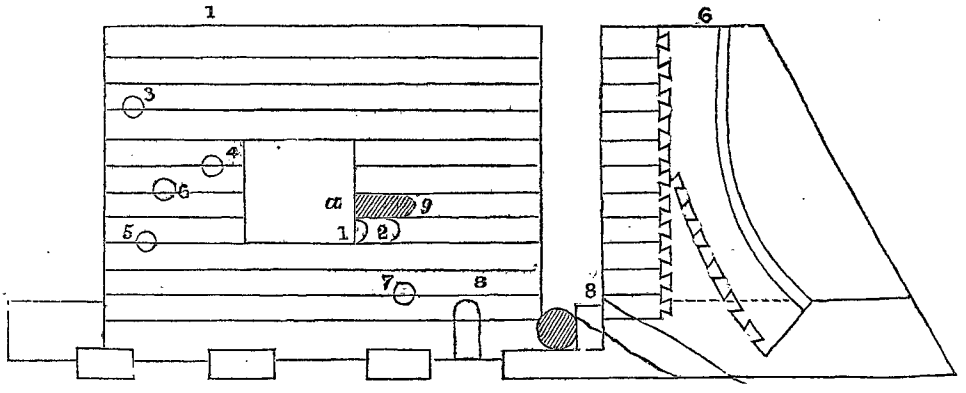
1352. (*Dr. Percy.*) Do you know whether there are any rolls large enough to produce a plate of these dimensions?—I have the guarantee of Mr. Hughes that he will produce these plates if required. The actual length of the rolls at Millwall is 8 feet, and there are 10 feet between the standards, and they can produce readily 7 feet 6; that would allow a foot for cutting off.

1353. What time do you think would be required to produce such plates, or to set to work, for it is not a matter of the roll only, but is it not a matter of the furnace as well?—If you require to know the time, I will send in to the Committee an estimate of the prices, and the time it will take to do the work.

1354. (*Chairman.*) Have you gone at all into the question of the manufacture?—Yes.

1355. Have you ascertained whether the pile would be a complete plate, the port-hole to be afterwards cut out, or whether it would be piled with a hole in the centre?—It would be made a complete armour-plate of that width, and the port-hole would afterwards be cut out; it would not be piled with a hole in it. I wish to hand in a letter, which I have received from St. Petersburg, stating the efficiency of the iron fortifications designed and executed by Mr. Hughes and myself. [The same was handed in, and is as follows]:—

"Ce n'est que ce matin que je suis parvenu d'avoir
"des renseignments exacts sur le tir contre le model
"envoyé par Mr. Hughes.

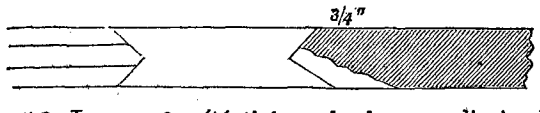


"On a tiré d'une piece de campagne de 4 rayé en
"acier, le poids du projectile, en acier fondu, dur, etait
"18 livres; la charge $\frac{5}{96}$ d'une livre russe; la distance
"350 pieds anglais; le choc de ce projectile contre le
"model-target correspondait, d'après le calcule, au choc
"d'un projectile de 200 lancé du canon en acier de
"Kroupp de 8", d'une distance de 700 pieds avec une
"charge de 31½ livres, contre un pareil parapet de gran-
"deur naturelle—

"1. Les 4 premiers coups ont fait des enfoncements
"de 1 pouce, sans endommager le parapet sous aucun
"rapport.

"2. Les coups 6 et 7 ont été tirés avec une charge
"de 1 livre, ils ont donné des enfoncements de 1½ pouces,
"sans faires d'autres dégats, excepté que 3 rivets à
"l'endroit 6 ont été rompus.

"N.B.—Les coups 1 et 2 ont frappé le même point,
"près de l'embrasure et ont enfoncé le bout de la barre
"de ¾ pouces dans l'enterieur.



"3. Le coup 8 a été tiré par la charge ordinaire de
"1½ livres, il a traversé la premiere barre et les poutres
"du fondement sans faire d'autres dègats.

"Le coup 9, la même charge de 1½ livres, a traversé
"le parapet et emporté une pièce a aubout de la barre
"No. 5, près d l'embrasure le projectile est tombé par
"terre à une distance de 30 pas.

"P.S.—Aucun des projectiles n'a changé de forme,
"tous ont perdus leurs envelloppes en plomb, l'acier
"etait parfait, de la fabrique d'Ouboukoff, aucun pro-
"jectile ne s'est brisé.

"Nous avons été trés satisfaits de ces résultats de tir
"et avons commandé à Colpino à l'assine du Gouverne-
"ment un parapet de ce système pour 6 canons."

1356. (*Colonel Adye.*) You propose to put on iron very thickly, both in front and behind, so that, according to your calculation, you will very nearly double the expense of the shield before you have done with it?—Yes, precisely.

1357. Do you not think it would be more simple and cheaper if you were to put on a 9-inch plate in front at once?—No; I do not think it would be equivalent to the work required of the target.

1358. Supposing you took the shield exactly as it stands, and you sent out two plates of 9 inches thick, with the junction running vertically, and no bolts, would not that be cheaper and more simple than the plan you propose?—Yes; it might be

Mr. Charles W. Lancaster.

5 Feb. 1868.

cheaper, but you would still be subject to the same radical weakness in the H girders behind.

1359. If you were to put one 9-inch plate in front of that shield, you would make the shield so stiff that the girders never could give way?—Whatever you put on in front, unless you supported this [pointing to the drawing] in the middle, by a sole plate, you would have these girders give way behind.

1360. No doubt the girders are a weak part of the structure, but the girders are weak because the front is so weak that it buckles, and the girders break; but if you stiffen the front, you will take the pressure off the girders?—To some degree you would, but I think that there should be some relative proportion settled between all the parts of the shield. I think you will see, if you will consider my plan, that the most important element will be added to the target in the sole plate, you will shorten all your bearings so greatly, that, practically, you will reduce the bearing of the girders to a short one like that [describing]. I think, therefore, the Committee will see there is good and valid reason for saying that what I suggest is absolutely essential.

1361. Omitting the sole plate, you propose to put on iron thickly at the front and the back, and it appears to me that it would be more simple and cheaper to put it on, at once, in a mass in front. No doubt, as you say, the girders, and every part, should bear, in strength, a relative proportion to each other; but our object now is to strengthen the target without aiming at perfection?—I have no doubt that if you put two 9-inch plates in front you would add greatly to the strength, but, I think, in a very inferior degree, to strengthening the back and the girders. In the whole general plan of the target, I do not think that the mere putting on iron in the front, without iron behind, would add the same strength that you would gain by my plan.

1362. (*Chairman.*) Can you state the cost of a 9-inch plate, 12 feet by 8, with the port-hole taken out?—I will send it in a letter to the Committee; the operation of cutting out the port-hole is expensive, and takes time. [The letter was sent, and is as follows]:—

"In reference to Colonel Adye's enquiry as to the "cost of two 9-inch plates, to be fixed vertically, with "the port-hole cut out, and 31 bolt-holes drilled, dimen- "sions 12 feet by 8 feet 2 inches, weight 13 tons 15 cwt., "I have made enquiry at the Millwall Iron Company, "and Messrs. Brown & Co., of Sheffield, and I find the "price in each case to be the same—viz., 37*l.* per ton, "equal to 585*l.* for the two plates, exclusive of the bolts, "4 inches diameter, about 100*l.*

1363. (*Dr. Percy.*) Do you think it is possible to do away with bolts and nuts, and substitute any other contrivance in your arrangement?—I think it possible to do away with the greater portion of the through bolts.

1364. (*Colonel Ward.*) With regard to the front plate, might we not, instead of putting one plate, like what you propose, in front, employ two pieces, one on each side, to protect this joint [pointing to the drawing]?—No; because here [describing] is one of your weak points.

1365. Do you remember this being tried the other day, with the 10-inch gun, and no sensible effect being produced?—I did not witness it, but I saw a report of the trial, and I saw, from that, that the girders were broken away very badly, and it is to be observed the sides of the 10″ shell were too weak, and the shell burst before it had given its maximum penetration.

1366. You propose to put behind these girders a plate like that [describing], and to have that plate supported by these plates [pointing to the drawing]?—Yes.

1367. Would not all that additional iron make this [pointing to the drawing] sufficiently strong?—I think not. I prefer a whole plate. In all these matters I think it may be taken as a proposition admitted that an entirety is better than two parts.

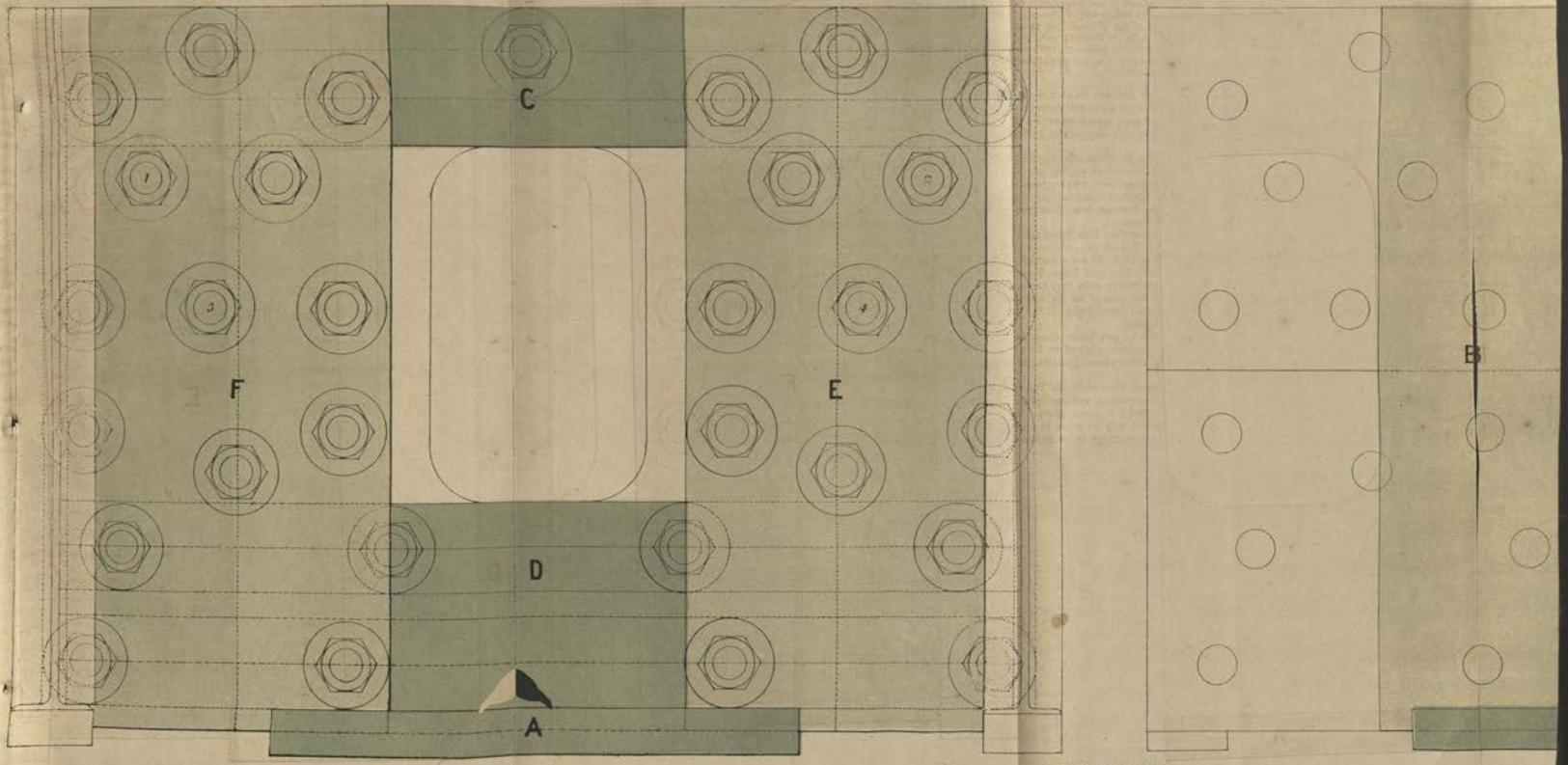
(The witness withdrew).

PROPOSED ALTERATION TO IRON SHIELDS FOR COAST DEFENCES.

DESIGNED BY C.W. LANCASTER JANUARY 1868.

Scale 1 Inch – 1 Foot.

BACK ELEVATION



REFERENCE.

A	Sole Plate	10.3 × 6.0 × 5	
B	Armour Plate	8.2 × 6.10 × 6	
C	Top Plate to strengthen Port Hole	11.0 × 18 × 4	
D	Bottom Plate to do. do.	11.0 × 2.7 × 4	
E	Vertical Plate. (Right Hand)	11.2 × 3.10 × 4	Bent
F	Vertical do (Left Hand)	11.2 × 3.10 × 4	Bent

Total Weight of the Six extra Plates 21 Tons, 10 Cwt., 3 Qrs., 0. — 21.10.3

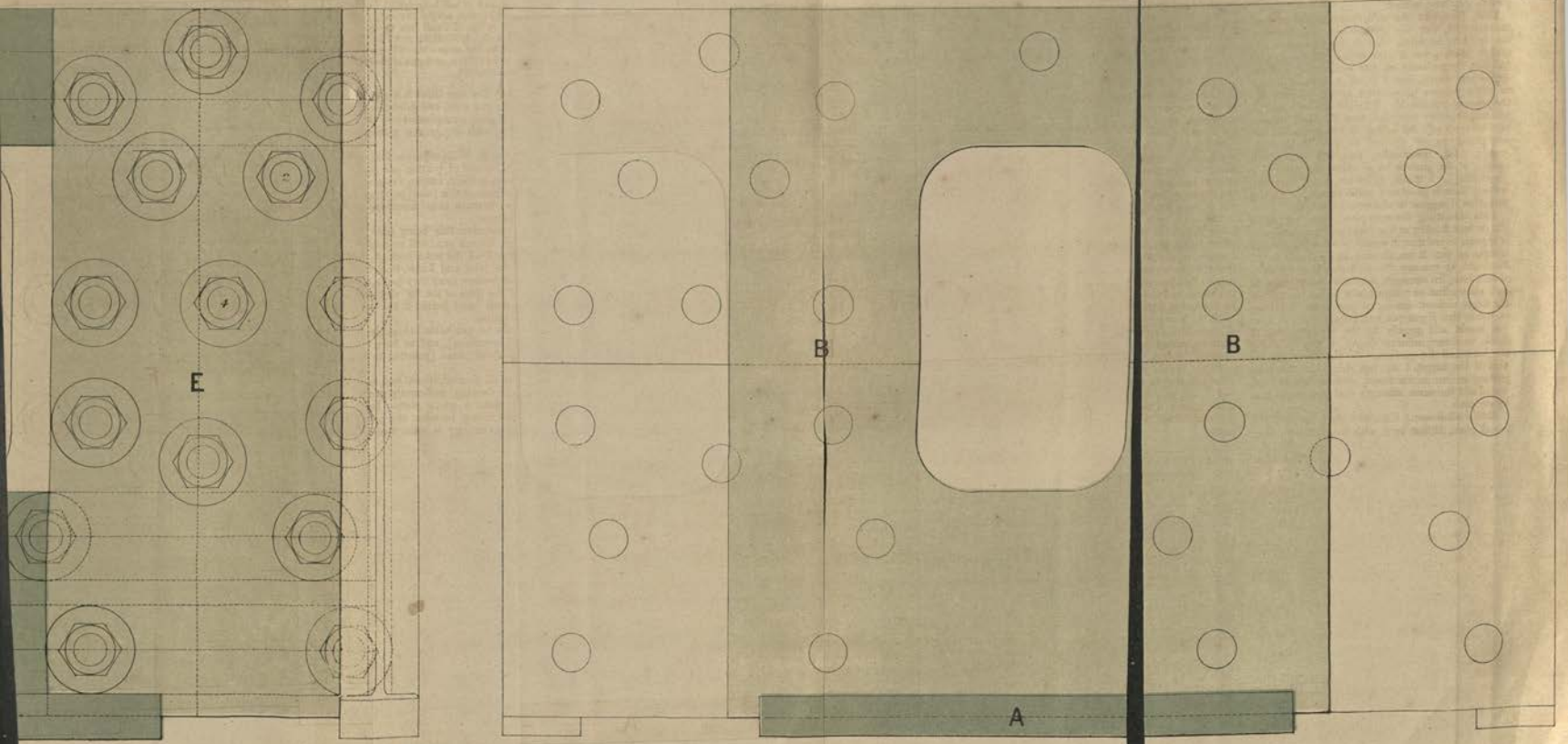
Bolts 4" diam.r for securing Plates 1 Ton. 9 Cwt. 2 Qrs. 11 lb

PROPOSED ALTERATION TO IRON SHIELDS FOR COAST DEFENCES.

DESIGNED BY C.W. LANCASTER JANUARY 1868.

Scale 1 Inch – 1 Foot.

FRONT ELEVATION



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Total Weight of the Six extra Plates 21 Tons, 10 Cwt., 3 Qrs., 0. — 21. 10. 3

Bolts 4" dia.r for securing Plates 1 Ton. 9 Cwt., 2 Qrs., 11 lb.

Mem. Colored parts additional, and the uncolored parts in accordance with W.O. Drawings issued to Contractors. Bolts numbered 1, 2, 3 & 4 in Shield are not shewn in W.O. Drawing as executed.

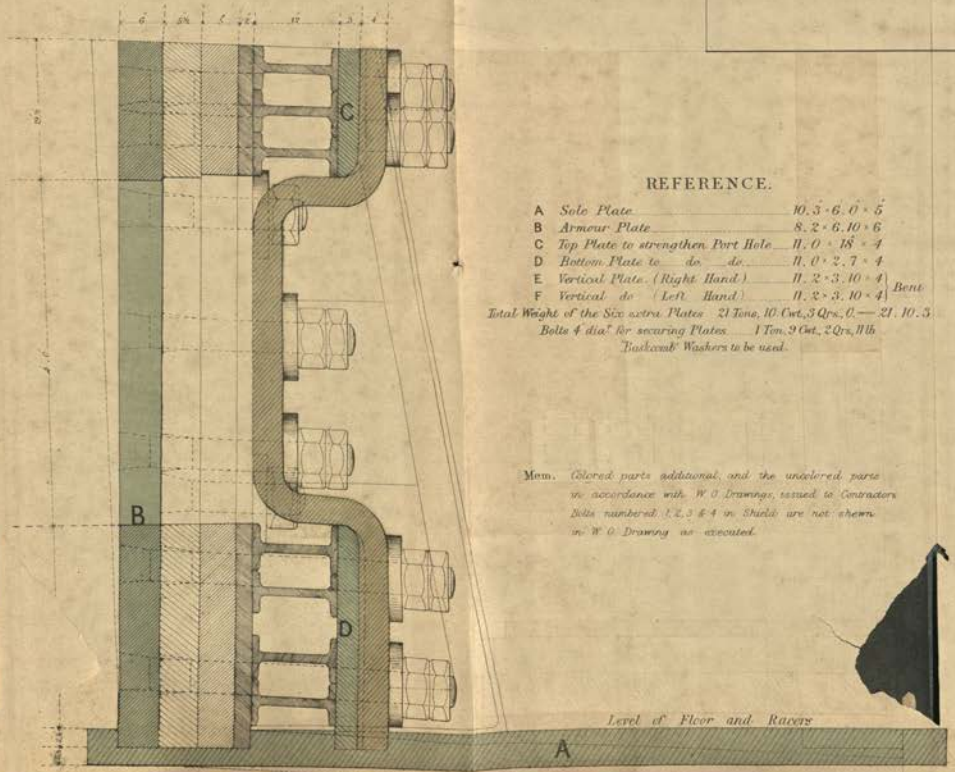
Charles Lancaster
5 Feby 1868

PROPOSED ALTERATION TO IRON SHIELDS FOR COAST DEFENCES.

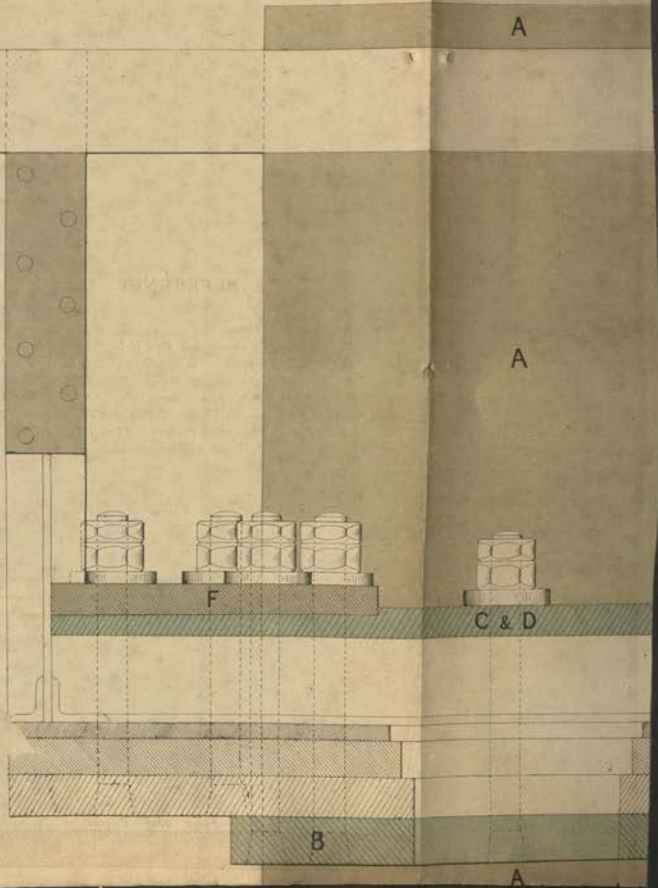
DESIGNED BY C.W. LANCASTER JANUARY 1868.

Scale 1 Inch = 1 Foot.

SECTION



SECTIONAL PLAN



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E	Vertical Plate (Right Hand)	11.2 × 3.10 × 4	Bent
F	Vertical do (Left Hand)	11.2 × 3.10 × 4	Bent

Total Weight of the Six extra Plates 21 Tons, 10 Cwt., 3 Qrs., 0. — 21. 10. 5.

Bolts 4" dia.r for securing Plates 1 Ton, 9 Cwt., 2 Qrs., 11 lb

'Badcomb' Washers to be used.

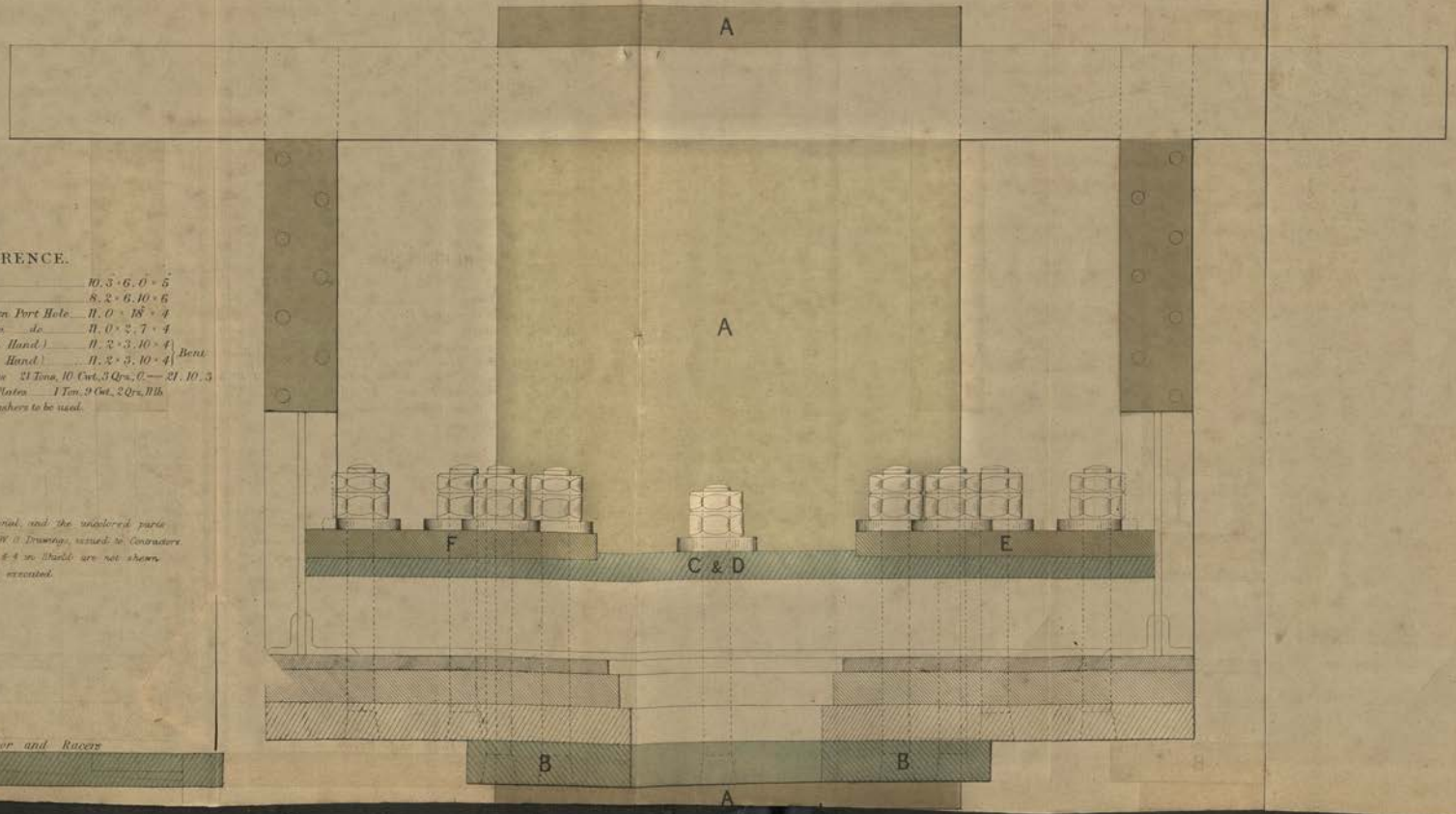
Mem. Colored parts additional, and the uncolored parts in accordance with W.O. Drawings, issued to Contractors. Bolts numbered 1, 2, 3 & 4 in Shields are not shewn in W.O. Drawing as executed.

PROPOSED ALTERATION TO IRON SHIELDS FOR COAST DEFENCES.

DESIGNED BY C.W. LANCASTER JANUARY 1868.

Scale 1 Inch = 1 Foot.

SECTIONAL PLAN



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D	Bottom Plate to do do	11.0 × 2.7 × 4
E	Vertical Plate (Right Hand)	11.2 × 3.10 × 4 } Bent
F	Vertical do (Left Hand)	11.2 × 3.10 × 4 } Bent

Weight of the Six extra Plates 21 Tons, 10 Cwt., 3 Qrs., 0. — 21.10.3

Bolts 4 dia.r for securing Plates 1 Ton, 9 Cwt., 2 Qrs., 11 lb.

Backcomb Washers to be used.

Mem. Colored parts additional, and the uncolored parts in accordance with W. O. Drawings, issued to Contractors. Bolts numbered 1, 2, 3 & 4 in Shield are not shown in W. O. Drawing as executed.

Level of Floor and Racers

A

APPENDIX.

APPENDIX No. I.

2, *Bickerton Terrace, Haverstock Hill,*
7th December, 1867.

App. I.

Mr. Chalmers' plan for improving Gibraltar Shields.

Sir,

PREVIOUS to the appointment of the above Committee, I had submitted to the Secretary of State for War a plan for improving the Gibraltar Shields. This plan will be laid before the Committee by the War Department. But as the several proposed alterations of the present shields were made in answer to questions about training the guns, &c., which were proposed to me by Colonel Jervoise, I now submit the enclosed drawing, which contains all the changes suggested.

It is proposed to bring the front (5½-inch) plate forward, say 10 inches, and between it and the second (or 5-inch) plate, place a compound backing similar in principle to that in the Chalmers Target, filling the cells *c* with a concrete of broken cast-iron and asphalte, or marine glue, instead of timber. To prevent the backing from being forced out laterally, by any shot that may penetrate the outer plate, the "box-girders," BB (sectional plan) are proposed. To allow the gun to train 70 degrees, the corners of the 5-inch and 1½-inch plates, shown in dotted lines at *d d*, would require to be trimmed off; and, to give complete freedom to the gun-carriage platform, the angle-irons *a a*, shown in dotted lines, would require to be turned as in the drawing. These, with the lengthening of the bolts, comprise the alterations proposed.

The chief advantages of the proposed alterations (apart from economy, and increased resistance to shot) are—

First. They can be made without removing any shield that may *now* be in position, and without boring any new holes.

Second. The series of vertical stringers *e* will utilize the support, or strength, of the ⊢ girders G, which at present do not strengthen the part of the shield most liable to be struck.

Respectfully submitting this proposal to the consideration of the Committee,

I have the honour to be,

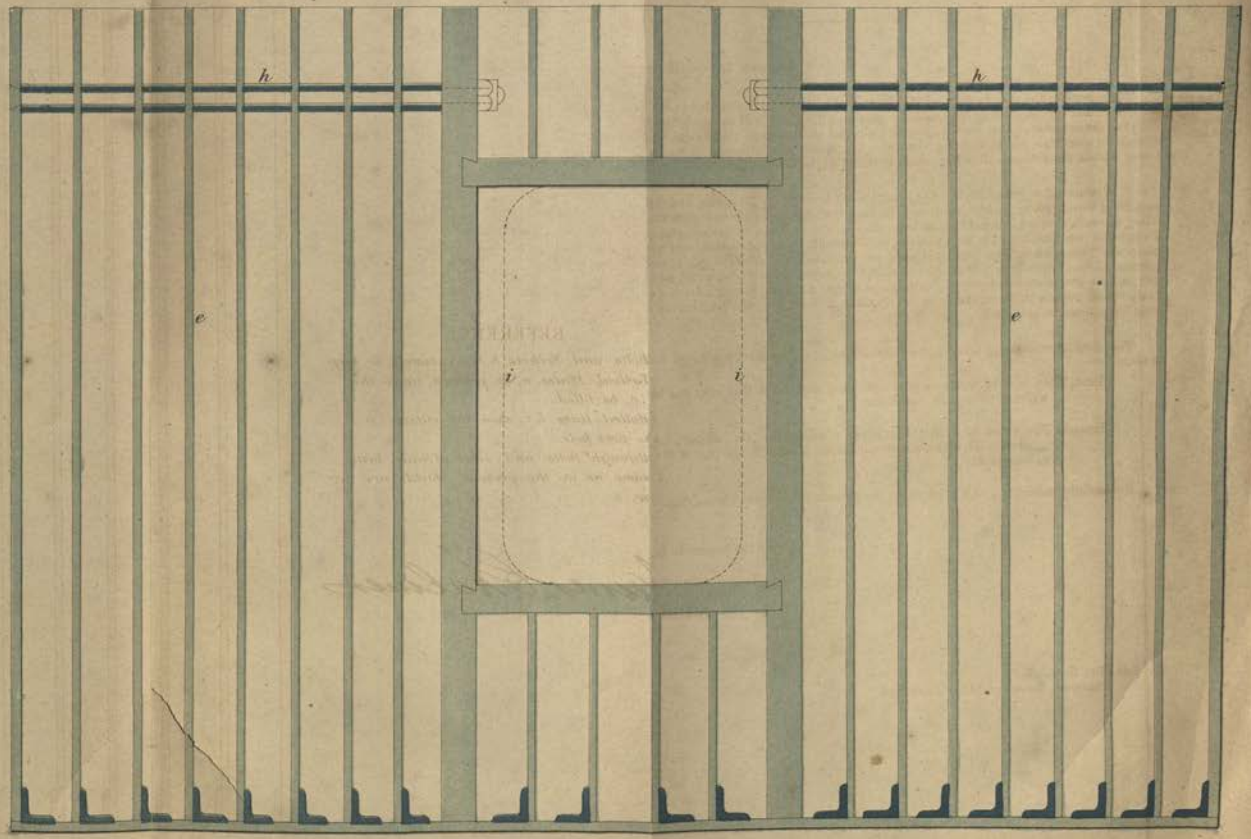
Your obedient Servant,

JAMES CHALMERS.

Sir John Hay, Bart., M.P.,
Chairman, Gibraltar Shield Committee.

PROPOSED IMPROVEMENT OF GIBRALTAR SHIELDS.

Scale, 1 in. = 1 Foot



ELEVATION — FRONT PLATES LEFT OFF.

REFERENCE

The Bolts and Sockets h.h. are merely to keep the Vertical Plates, e, in position until the cells c, be filled.
The dotted lines i, i, show the outside size of the port hole.
The through Bolts, and other details, being the same as in the present Shields are not shown.

James Chalmers

PROPOSED IMPROVEMENT OF GIBRALTAR SHIELDS.

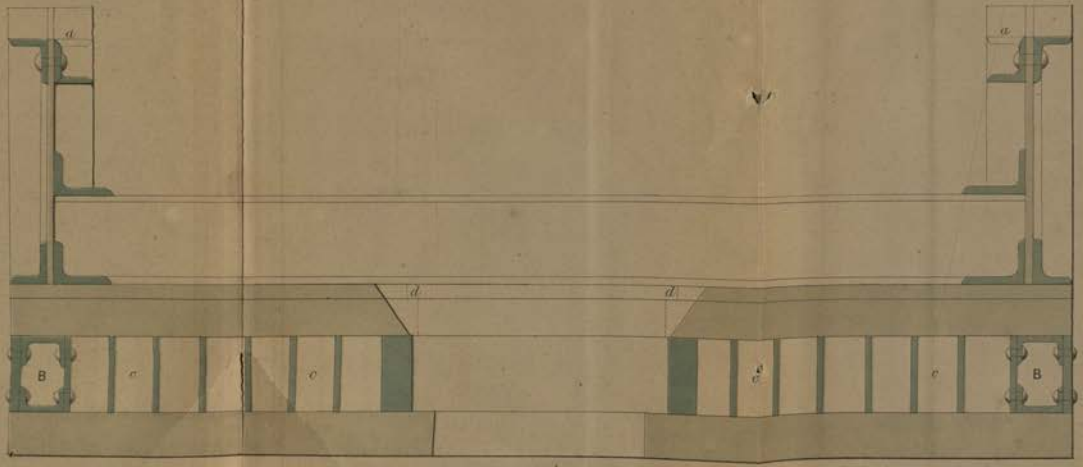
Scale, 1 in. = 1 Foot

REFERENCE.

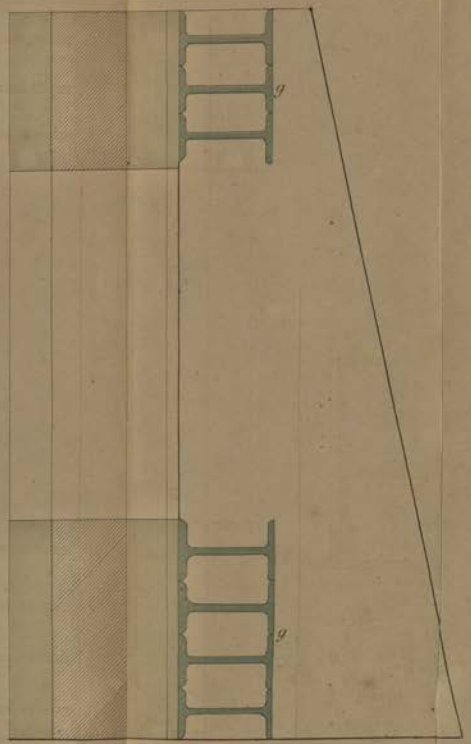
The Bolts and Sockets b, b, are merely to keep the Vertical Plates, c, in position, until the cells C, be filled.

The dotted lines i, i, show the outside size of the port hole.

The through Bolts, and other details, being the same as in the present Shields are not shown.



SECTIONAL PLAN



VERTICAL SECTION

James Chalmers

GIBRALTAR SHIELD WITH IMPROVED BACKING

Scale 1½ In. 1 Foot.

Reference *The improved Box girders B.B. require no rivets. The cells are shown fitted with the proposed concrete of broken cast iron and asphalte.*

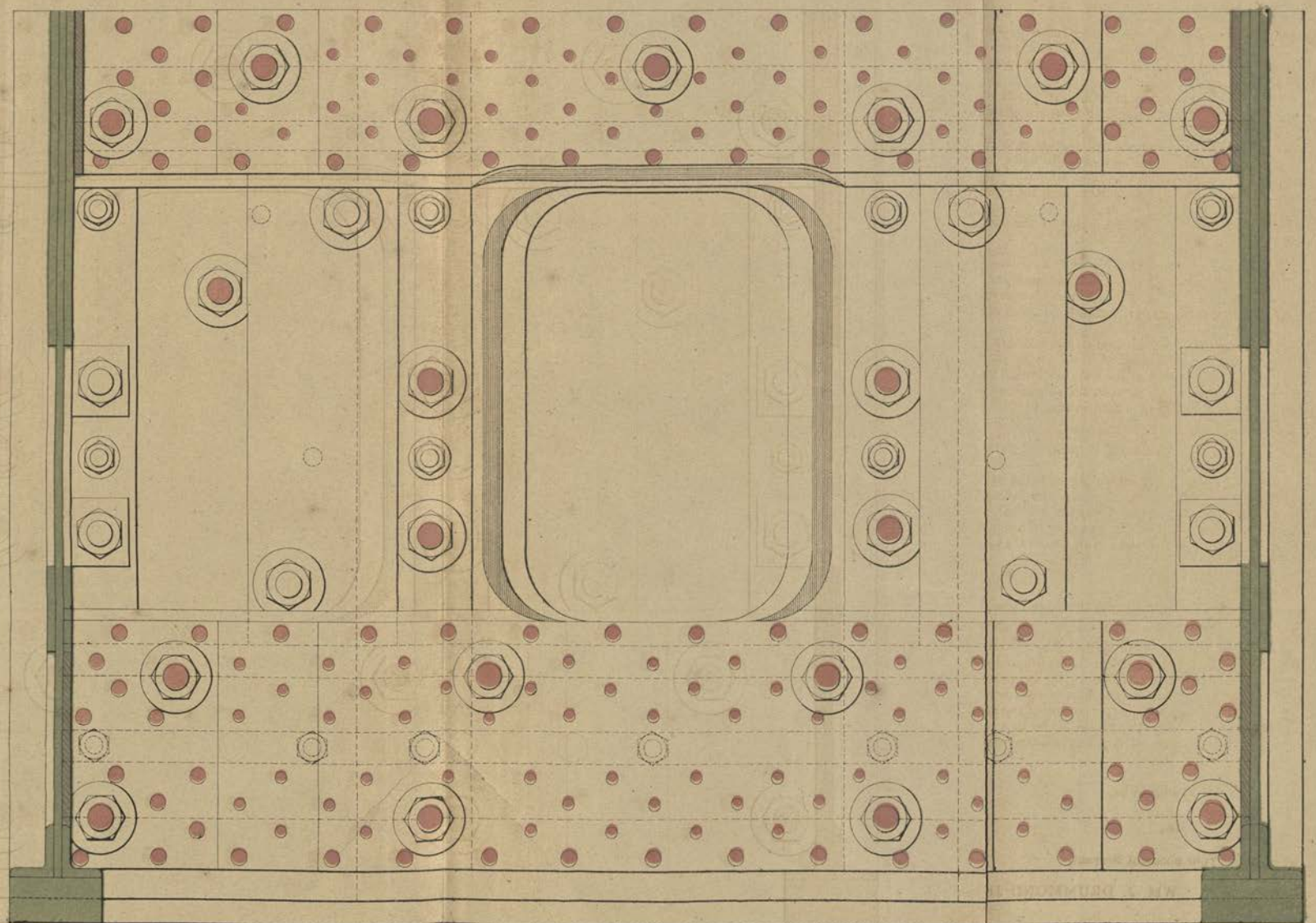
SECTIONAL PLAN

James Chalmers

SUGGESTION Nº I. FOR STRENGTHENING GUN SHIELDS.

To accompany my letter to the Select Committee on Iron Shields, dated 10th February 1868.

Wm. F. Drummond Servois



REAR ELEVATION

Scale 1 Inch to One Foot.

Inches 12 9 6 3 0 1 2 3 4 5 6 Feet

APPENDIX No. II.

App. II.

Suggestions for strengthening Gibraltar Shields, submitted by Works Department, War Office.

Sir,

War Office, 10th February, 1868.

I HAVE the honour to request you will lay before the Special Committee on Iron Shields the accompanying designs, showing three methods which might be adopted for strengthening the Shields supplied for Gibraltar and Malta,—one of which has been lately tried at Shoeburyness,—in the event of its being deemed desirable to make any of them more proof against guns of the largest natures at short ranges.

The following will briefly explain each method:—

No. 1 *Suggestion.*—An additional thickness of 5 inches of armour is introduced in rear of the front plates over the whole shield. This consists of a 5″ armour plate occupying all the space on either side of the port, and equal in height to it, two armour bars of section 16½″ × 5″ extending right across the shield below the port, and one similar bar above the port.

The whole of the present ⊢ girders are strengthened by means of additional plates rivetted to their back flanges, a strong connection being made with the struts by bending back one plate at either end, and securing it to the web of strut.

To give additional support behind the vertical joint in the proposed 3rd thickness, a 16½″ × 5″ armour bar is laid on flatways on either side of the port, their top and bottom ends being secured to the ⊢ girders next above and below the port, these being strengthened and fitted for the purpose.

About 21 of the armour bolts will have to be removed, but the proportion of fitter's work to be done on the spot is very small.

The cost of this proposal would be about 340*l.*, of which nearly 200*l.* is due to the additional 5″ thickness of armour.

No. 2 *Suggestion.*—An additional 5″ thickness of armour is provided precisely as in No. 1.

The arrangement of skin and ⊢ girders is completely reversed, the skin being made to cover the back of the girders on a plan proposed by Lieutenant English, R.E. This has the advantage of giving additional strength to the ⊢ girders in the part most requiring it, without the addition of any new material for the purpose.

The strength of the shield on either side of the port is further increased by the addition of vertical ⊢ girders framed at top and bottom into the existing horizontal girders.

Twelve new armour bolts have to be made, and the greater part of the nuts are buried and unseen in timber with which it is proposed in this plan to fill in the spaces between the ⊢ girders.

There is a good deal more fitter's work left to be done on the spot than in No. 1.

The cost would be about 330*l.*

No. 3 *Suggestion.*—The same additional thickness of 5-inch armour is provided as in the two former plans.

This method differs from the others principally in dispensing altogether with the existing skin and ⊢ girders (which would be turned to good account for the roofs of expense magazines or other small buildings in connection with the defences), and substituting for them two vertical 16½″ × 5″ armour bars, one on either side of the port, and two horizontal bars of the same section, one above and the other below the port. These latter receive support from the struts, and in their turn give support to the vertical bars.

Seventeen of the bolts have to be renewed.

There is scarcely any fitter's work to be done on the spot.

The cost of this method would be about 320*l.* without taking credit for the value of ⊢ girders and skin used elsewhere.

In each of these three methods the extent of lateral training is only reduced by 2½° on either side of the port, and the same amount of elevation and depression is obtained as in the original shield; the material in the shields as first constructed is almost wholly turned to account; the proposed additions can be supplied from England and fixed on the spot, without scarcely any fitter's work being required at the station; the additional material, moreover, is so designed that the cost per ton of the strengthened shield would not exceed that of the shields as first made; lastly, they would yet be in a condition to receive a still further accession of strength should the progress of Artillery science ever render it desirable.

I have the honour to be,

SIR,

Your obedient Servant,

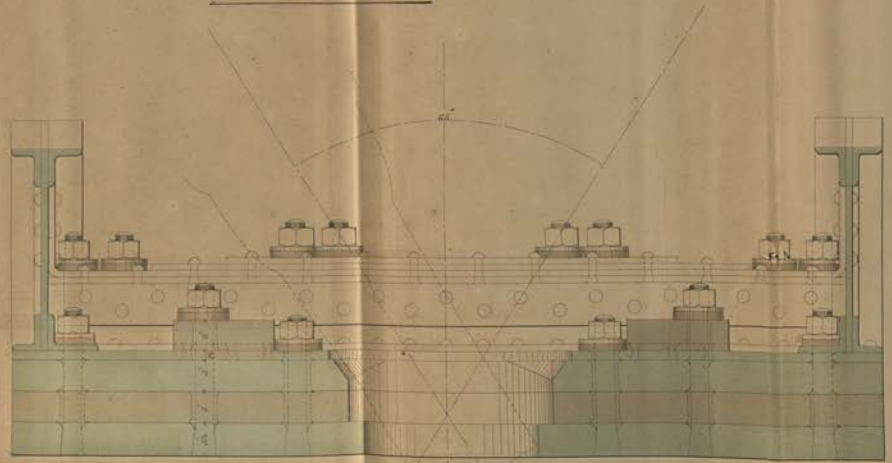
WM. J. DRUMMOND JERVOIS.

The Secretary to the Committee on Shields.

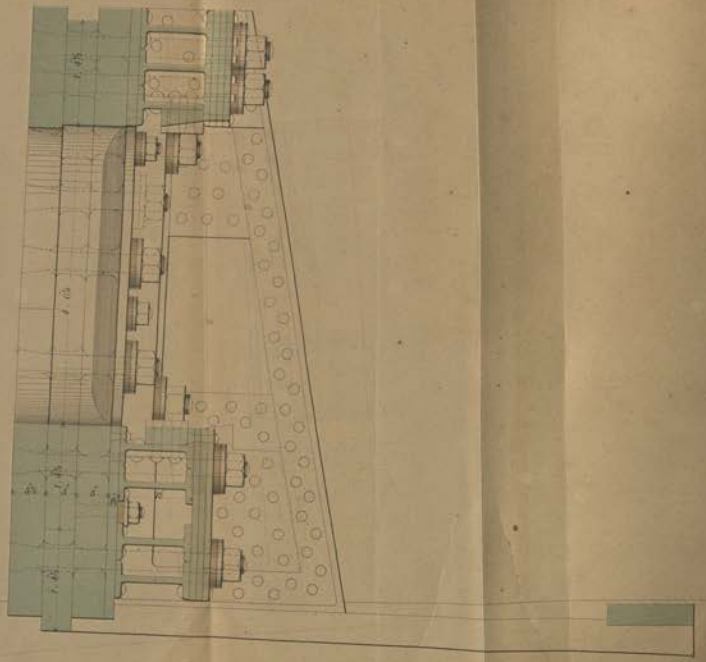
SUGGESTION Nº I. FOR STRENGTHENING GUN SHIELDS.

To accompany my letter to the Select Committee on Iron Shields, dated 10th February 1868.

Wm. J. Drummond Jervois

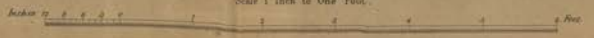


PLAN



SECTION

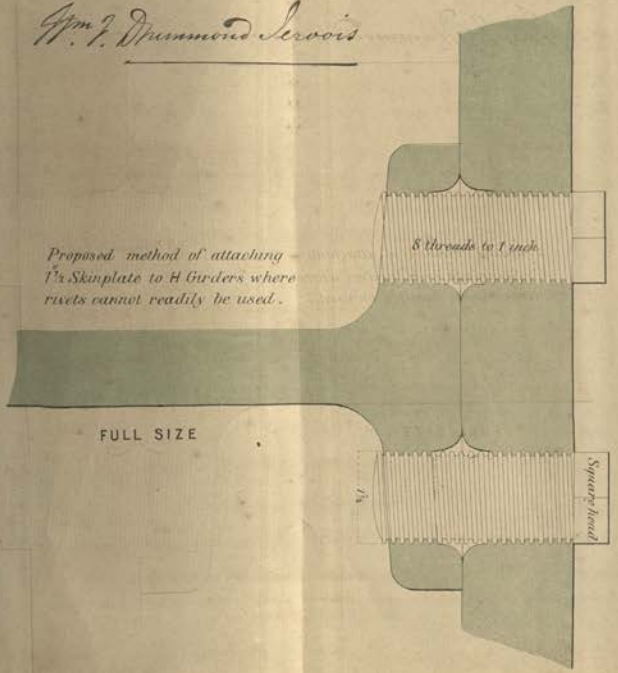
Scale 1 Inch to One Foot.

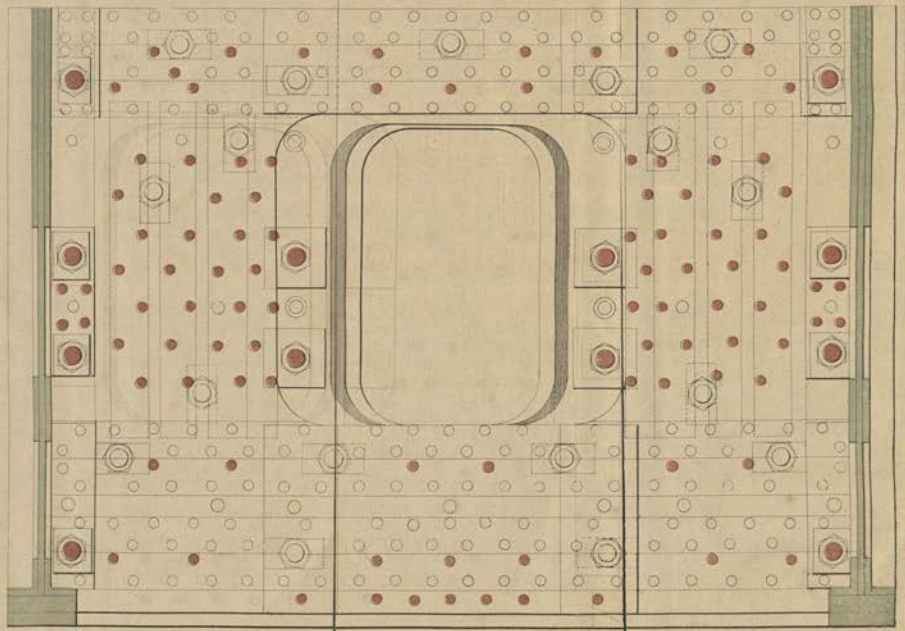


SUGGESTION N° 2. FOR STRENGTHENING GUN SHIELDS.

To accompany my letter to the Select Committee on Iron Shields dated 10th February 1868.

Wm. F. Drummond Servois


Proposed method of attaching 1½ Skinplate to H Girders where rivets cannot readily be used.
8 threads to 1 inch.
Square head
FULL SIZE



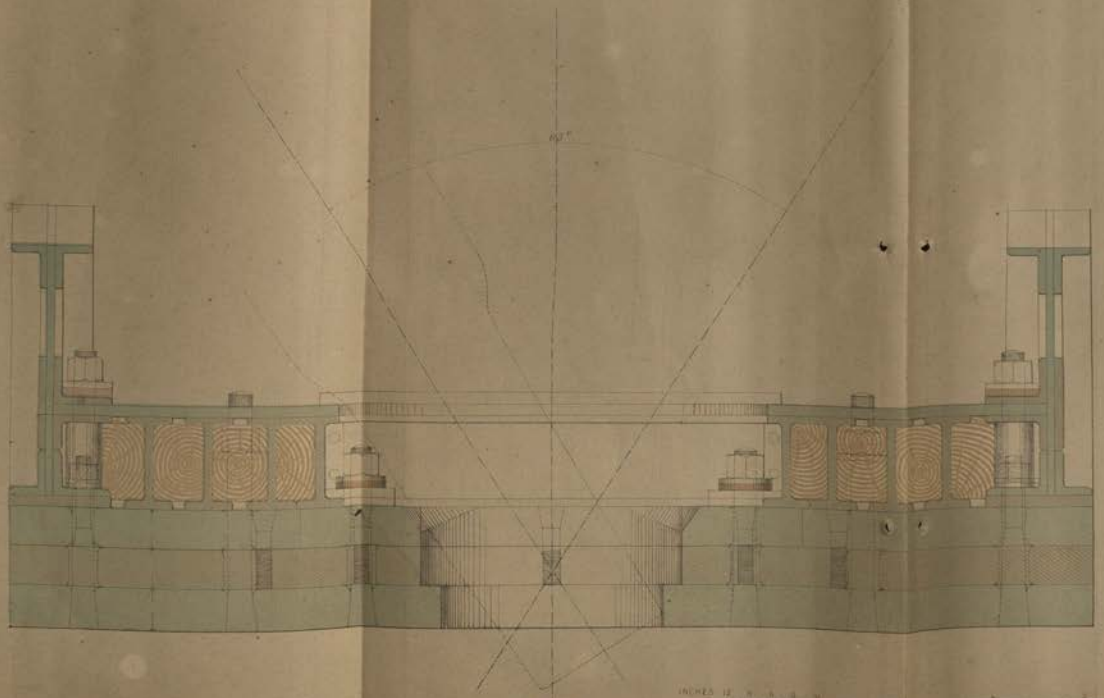
REAR ELEVATION

SCALE 1 INCH TO ONE FOOT

SUGGESTION Nº 2. FOR STRENGTHENING GUN SHIELD

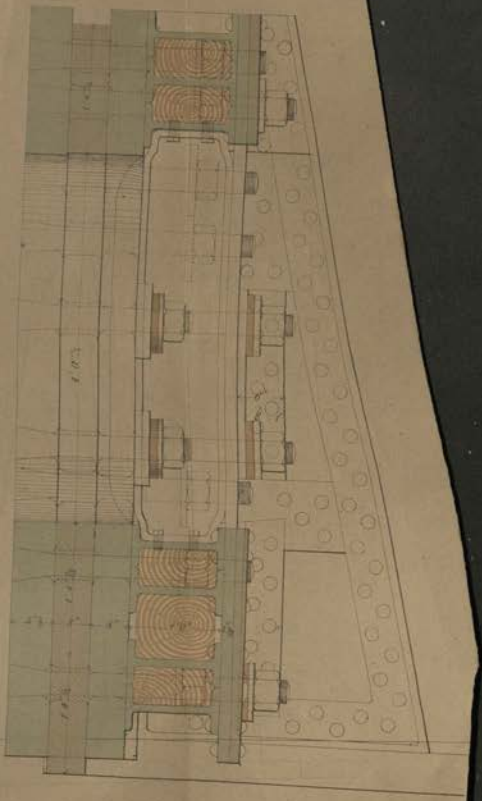
To accompany my letter to the Select Committee on Iron Shields dated 10th February 1868.

Wm. J. Drummond Servois



PLAN

INCHES 12 9 6 3 0 9 FEET

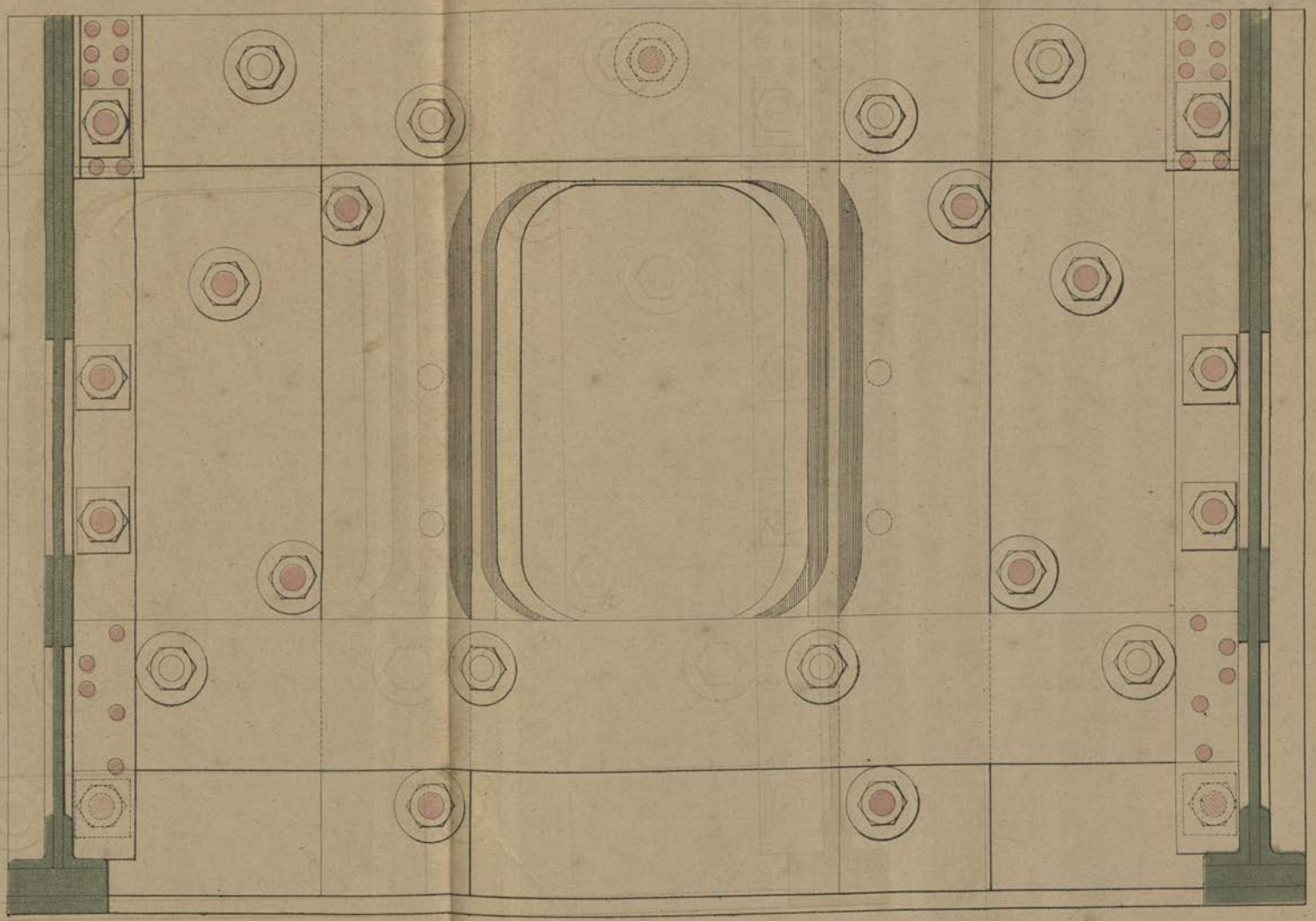


SECTION

SUGGESTION Nº 3. FOR STRENGTHENING GUN SHIELDS.

To accompany my letter to the Select Committee on Iron Shields, dated 10th February 1868.

Jpm J. Drummond Servois



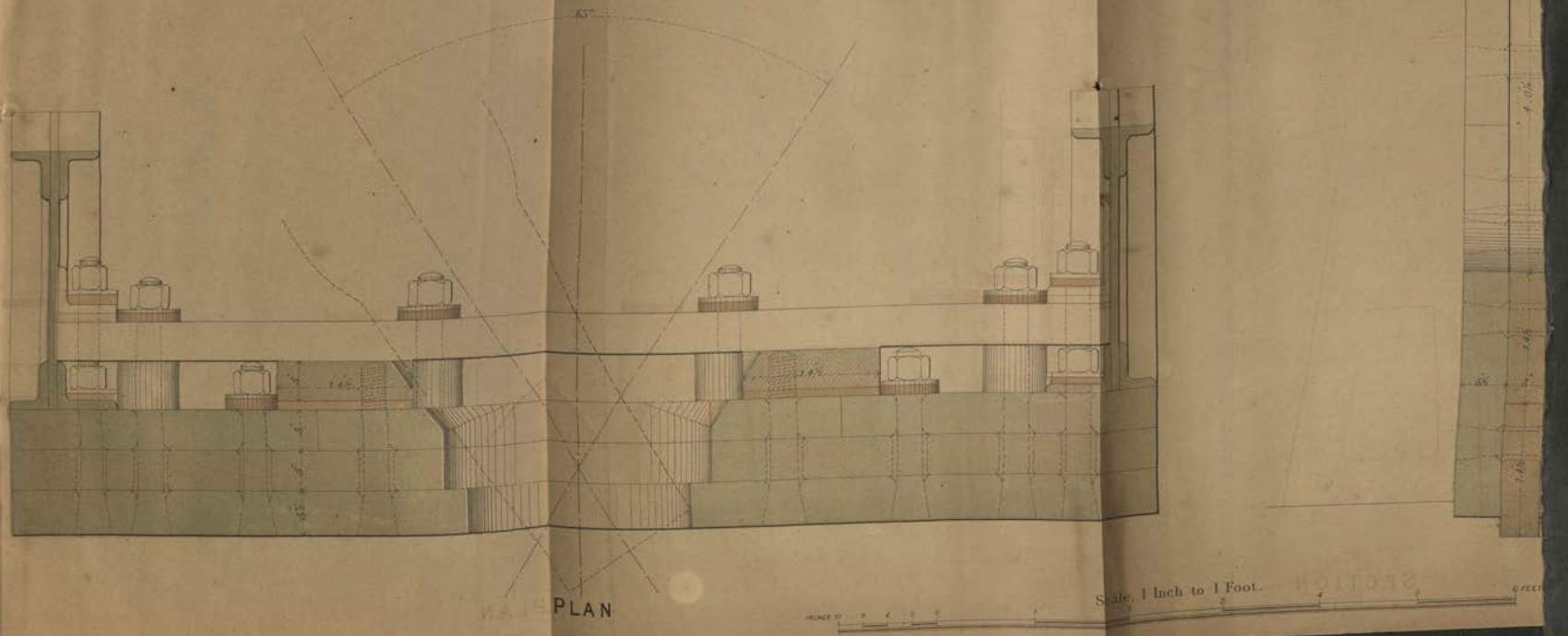
REAR ELEVATION.

Scale 1 Inch to One Foot.

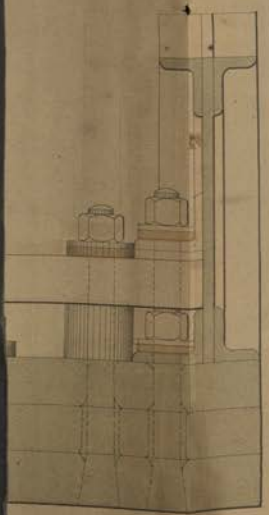
SUGGESTION Nº 3. FOR STRENGTHENING GUN SHIELDS.

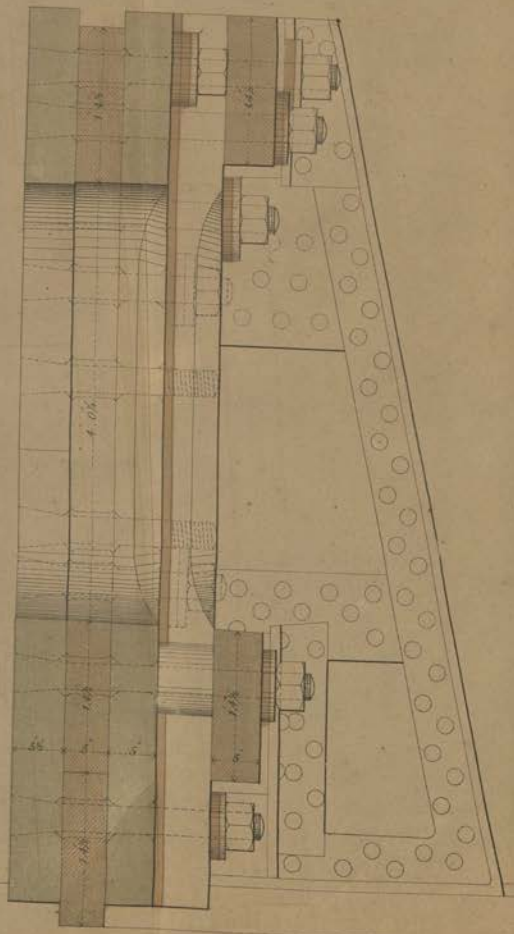
To accompany my letter to the Select Committee on Iron Shields, dated 10th February 1868.

Wm. J. Drummond Servois



ON Nº 3. FOR STRENGTHENING GUN SHIELDS.





Scale, 1 Inch to 1 Foot.

SECTION

TAKEN BEFORE THE SPECIAL COMMITTEE ON IRON SHIELDS.

APPENDIX No. III.

pp. III.

gestions strengthen- Gibraltar lds, sub- ed by Mr. Wilson.

Cyclops Steel and Iron Works, Sheffield,
17th February, 1868.

Dear Sir,

I PROMISED to consider the best mode of strengthening the present Gibraltar Shields, and to give the Committee an approximate cost of replacing the front 5½-inch armour plates with stronger plates of 9-inch thickness.

I enclose a tracing, showing two modes of dealing with the present structures. One, by adopting *throughout* 9-inch armour for the front plates, and throwing out the present 5½-inch plates for probable use in future structures (See Section No. 1).

The other mode of strengthening the shields would be by putting the proposed 9-inch plates in only *half* the present number of shields (17), then to take the 5½-inch plates replaced by the 9-inch, and introduce them into the remaining number of shields (17). I would propose to do this as shown in Section No. 2: viz., by placing them between the vertical 5-inch plates, and the 1½-inch skin-plates, which would give a total thickness of armour of 17½ inches against 15½ inches, in the case where the shields are strengthened by the 9-inch front plates.

N.B.—These 5½-inch plates in this position would also support the vertical 5-inch plates now dependent upon the 1 -inch skin-plates.

This suggestion, if carried out, would provide an immediate use for all the 5½-inch plates replaced by the 9-inch, and would at the same time make a comparatively strong shield, the 2 inches additional thickness of iron in a measure compensating for the two joints of the 5½-inch plates being on the same line.

The cost of two 9-inch armour plates, each 12 feet long × 4 feet 1 inch wide, for the front of the present shields, with bolt holes drilled and countersunk to our templates, so that they would fit accurately over the other plates in the shields, and with the port-holes cut out, would be about 550*l.*

Assuming that all the bolts in the present shields would have to be returned to England, and replaced with those of the later design, the cost of bolts (the present nuts and washers being used again) would be about 25*l.* per shield.

This would make a total cost per shield of 575*l.*, or, for the 17 shields, a total of 9,775*l.*

In order, however, to make the 2 front 5½-inch plates fit in between the vertical 5-inch and 1½-inch skin-plates, it would be necessary to widen the port-holes in them, and the cost of this, including carriage both ways, &c., as also for the new bolts consequent upon the increased total thickness of the front of the shield, would be about 85*l.* per shield.

Adopting for the moment this view of disposing of the whole of the shields, the average cost per shield would stand thus, viz.:—

	£
17 Shields at 575*l.* each	9,775
17 „ „ 85*l.* „	1,445
Total expenditure	£11,220

Or an average *all round* of 340*l.* per structure.

Looking at the question in all its bearings, I am satisfied that this would be the most economical method of dealing with it, and shields of such resistance would be so secured as to be impenetrable to any gun at present in service.

I am, dear Sir,

Your obedient Servant,

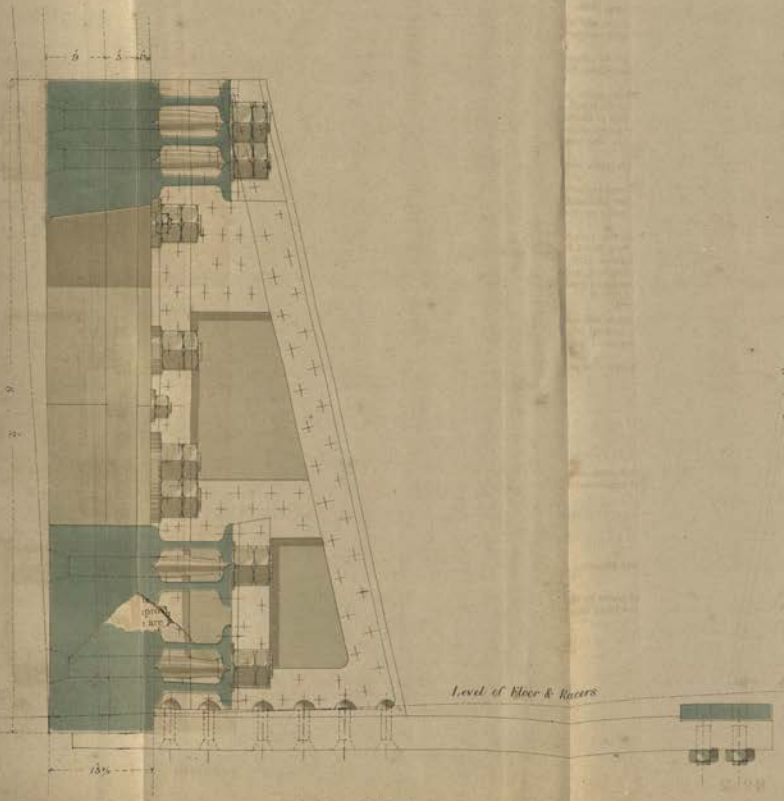
GEO. WILSON, *Managing Director.*

P.S.—I have assumed that the bolt-holes would all be widened out behind the front plates by the War Department, except in the case of the 17 sets of two 5½-inch plates, the cost of the latter being included in our prices given above.

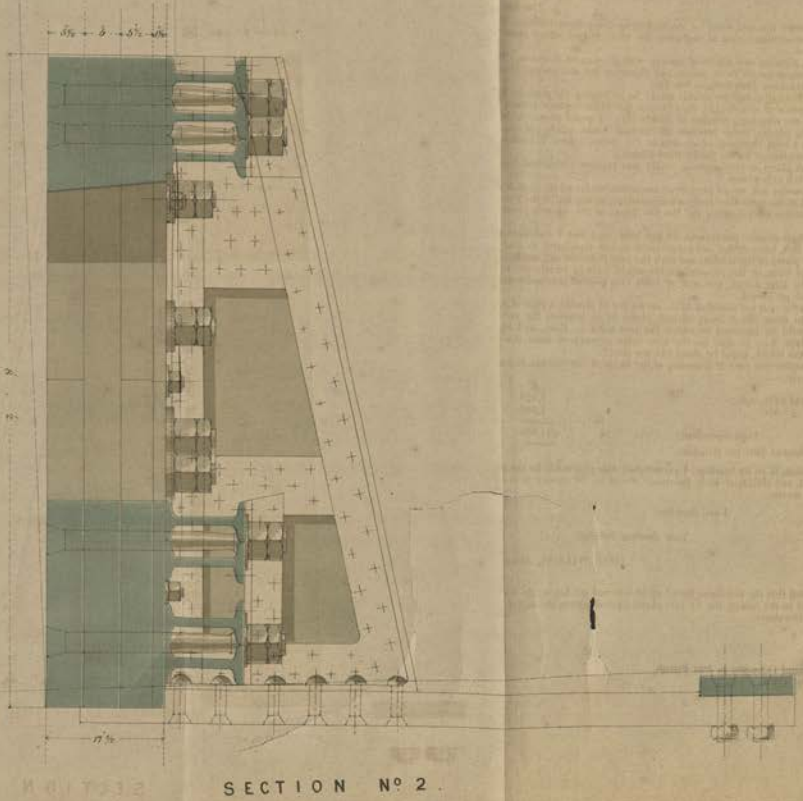
Captain Harrison, R.A.,
Secretary of the Special Committee on Iron Shields,
War Office.

DESIGN FOR PROPOSED STRENGTHENING OF SHIELDS FOR COAST DEFENCES.

BY C. CAMMELL & Co LIMITED CYCLOPS WORKS SHEFFIELD.



SECTION No 1.



SECTION No 2.

APPENDIX No. IV.

G. No. 14. 1185.

App. IV.

Report of Ordnance Select Committee on First Trial of Gibraltar Shield.

REPORT of the Ordnance Select Committee, on the Trial of the "Gibraltar" Iron Shield, at Shoeburyness, 25th October, 1867, with reference to War Office Minute, 11th October, 1867, on G. N. 14, 1180.

Present:

BRIGADIER-GENERAL LEFROY, R.A., *President.*

CAPTAIN W. G. LUARD, C.B., R.N.
COLONEL FREELING, R.E.
LIEUT.-COLONEL G. SHAW, R.A.
LIEUT.-COLONEL T. L. MAYNE, Unatt.
MAJOR HEYMAN, R.A., *Secretary.*

The Committee have the honour to report that, pursuant to the instructions conveyed in the War Office paper quoted in the margin, they proceeded to Shoeburyness on the 25th ultimo, with a view to test a specimen of the Iron Shields which, it is understood, have been designed and issued in some numbers for the works at Gibraltar, Malta, and Bermuda.

The construction of the Shield may be briefly described as follows:—

A front plate of $5\frac{1}{2}$ inches overlies another of 5 inches thick, both being supported in the rear by a plate of $1\frac{1}{2}$ inch in thickness. Below the port-hole, which is 48″ × 29″, giving an opening of about $9\frac{2}{3}$ square feet, there are four 12-inch ⊢ girders running horizontally, and above the port-hole three similar girders, all being attached to the armour-plates by through-bolts, 3″ diameter, reduced in the shank on Major Palliser's principle.

The whole Shield is 12 feet long by 8′ 2″ high, being composed of two superposed longitudinal plates, each 4′ 1″ wide: their line of junction is therefore central. The structure is supported at each end by a strut or buttress, consisting of a plate and angle iron with flanges 15 inches wide, bearing against the back of the shield; these buttresses are fastened by bolts to two transverse beams 11″ × 5″, which, in their turn, are tied together by a longitudinal beam 14′ × 3″, and weighted down by some tons of old iron, heaped upon them in rear.

The two thicknesses of armour-plates and the inner skin are attached to each other by 29 through-bolts, 3″ diameter, the inner and centre plates being further secured by 19 bolts, 2″ diameter.

In accordance with the wishes of the Deputy Director of Works, the following guns were placed in position for the trial:—

The 9-inch gun of 12 tons, the 10-inch of 18 tons, and the Rodman XV-inch gun of 20 tons. Range, 70 yards, but charges reduced to represent the striking velocity due to full charges at 400 yards.

Two rounds were, however, only fired from the 9-inch 12-ton gun, Palliser shot, weight 250 lbs., reduced charge 37 lbs.

The following are the results:—

No. 1. Photo. No. 1469.

Struck lower section on point aimed at, viz., 42 inches from left side, and 21 inches from bottom of shield. The shot cracked, part of it remaining in plates; piece of shot projecting 7 inches from face of front plate. *Penetration*, 10·9″.

It should be observed that this shot was fired designedly at that part of the shield which is strengthened by the horizontal ⊢ girders already described. The effect was that three of them were cracked through the outside flanges, the upper one being further cracked longitudinally through the web, for a length of 7 or 8 feet near the neutral axis.

The inner, or $1\frac{1}{2}$-inch plate was forced back from the next adjacent 5-inch plate, $\frac{1}{4}$ inch.

In addition to the above, the effect of this shot was the breaking of no less than nine 3-inch through-bolts, and five 2-inch bolts, three of the former occurring in the upper plate, which was not struck, and one, which although on the lower plate, was on the opposite side of the port-hole.

Round No. 2. Directed at the other half of the target. Photo. No. 1470.

Struck upper plate 36″ from right edge and $9\frac{3}{4}$″ from bottom of plate, on portion of shield between the upper and lower tiers of ⊢ girders. The shot broke up as usual, part of it remaining in the hole, and part projecting $6\frac{1}{2}$ inches. *Total penetration*, 11·4 inches.

The $5\frac{1}{2}$″ plate was completely penetrated, and the head of the shot almost passed through the 5″ plate, rending the inner $1\frac{1}{2}$″ plate in a manner which is best shown by the annexed photograph; it was fissured vertically to the extent of 34 inches, and horizontally to the extent of 5 inches, the opening at the widest part being 3 inches. The jagged edges of the broken portion of the 5-inch plate behind were just visible through the opening. The skin was bulged at this part as much as 7 inches. Of the 3-inch through-bolts, seven more were broken by this round, and two additional 2-inch bolts.

It is important to remark that, in almost every instance, the bolts separated at from 5 to 7 inches from the head, and not, as has usually been observed, at the screw thread.

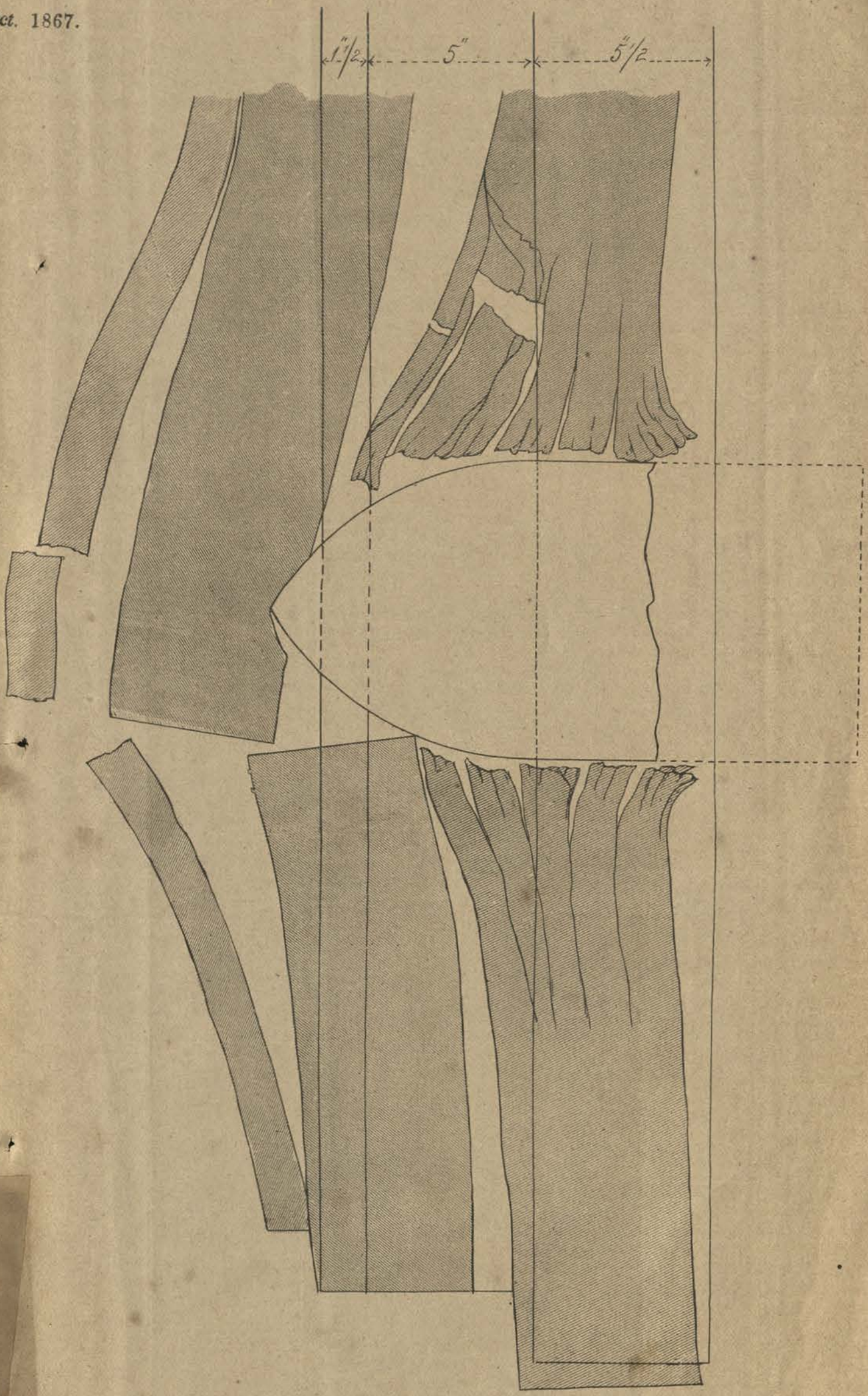
Lieut.-Colonel Inglis, R.E., who was present, thinks it possible that the bolts may have been overstrained in the operation of tightening up, and, looking to the mechanical appliances used by the workmen employed in the erection of the target, the Committee think it not improbable that this unusual effect is partly, at least, to be accounted for by this cause. The Committee are since informed that the bolts have not been made in accordance with Major Palliser's patent, but they consider that the rigidity of the whole structure, and the absence of any elastic medium to absorb the shock, except $\frac{3}{4}$-inch indiarubber washers, is likely to have contributed very much towards their fracture. These washers were excessively compresed, and in some instances jumped clear over the iron washer behind them. Considering it would be unfair to the structure to proceed with the trial in its present condition, the Committee recommend that the whole of the bolts be replaced at once by proper ones, and that on the next occasion the fire be continued until the shield is fairly breached to such an extent as to cease to afford protection to the space it covers.

J. H. LEFROY, *Brig.-Gen. R.A., President.*

9th November, 1867.

HORIZONTAL SECTION THROUGH THE GIBRALTAR SHIELD WHERE STRUCK BY 9-INCH SHOT No. 1470.

25 Oct. 1867.

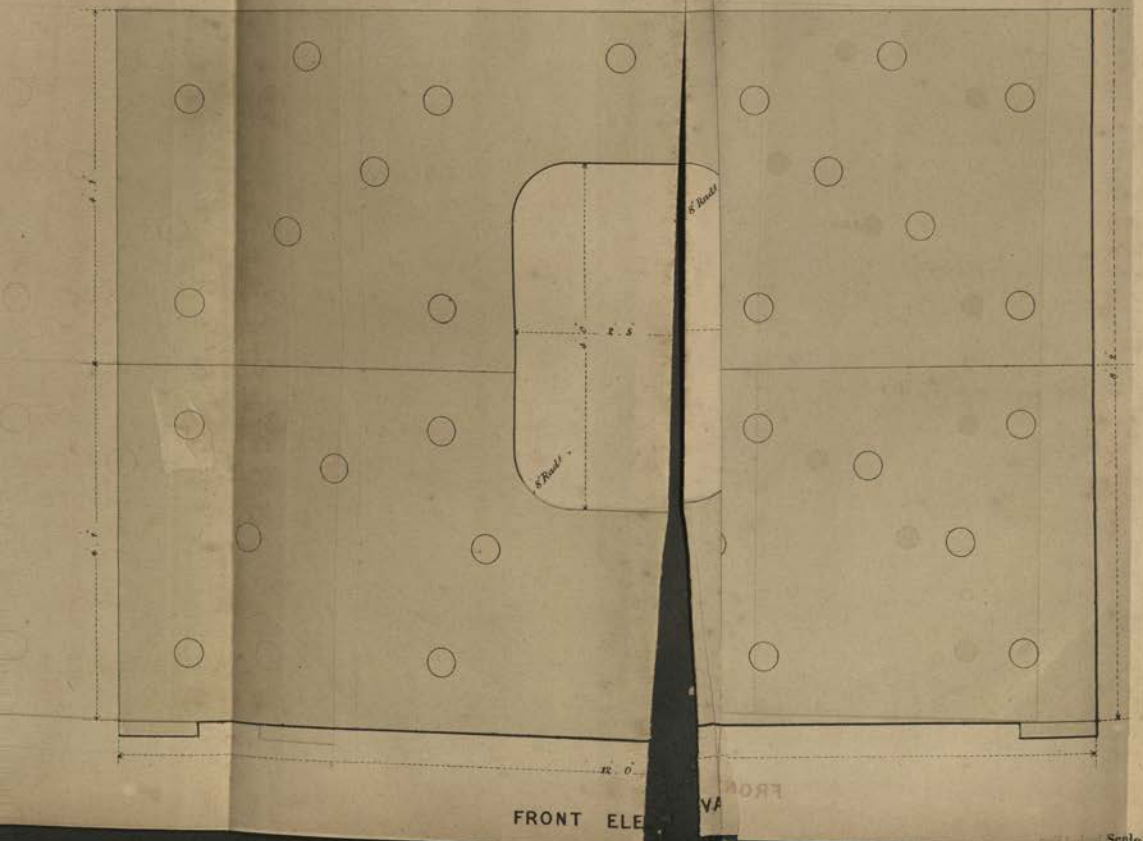


1/4 TH " FULL SIZE

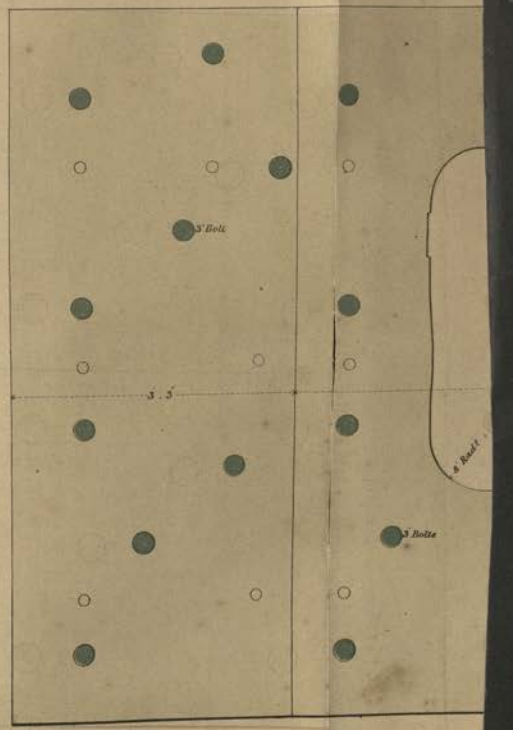
J Hk.

IRON SHIELD FOR COAST DEFENCES.

AS EXECUTED.



FRONT ELE VA



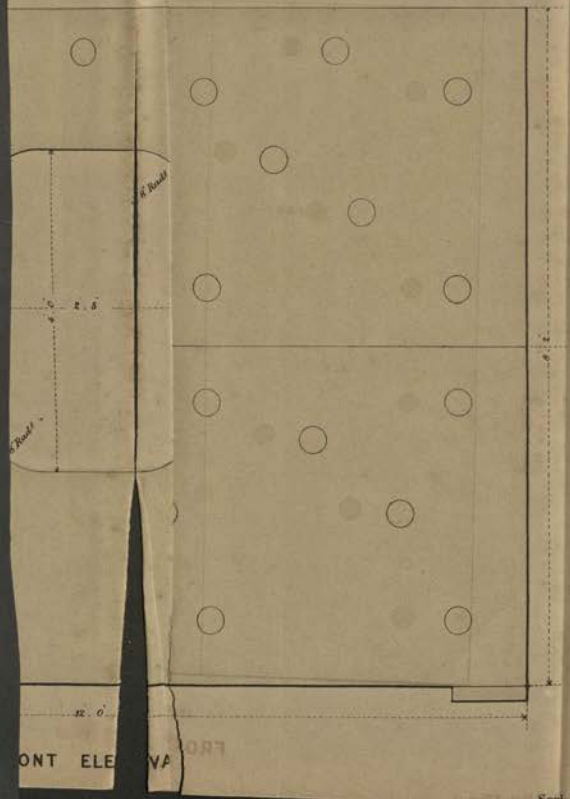
FRONT ELEVATION W

Scale 1 Inch=1 Foot.

IRON SHIELD FOR COAST DEFENCES.

AS EXECUTED.

Wm F. Drummond Servis
December 1st 1866



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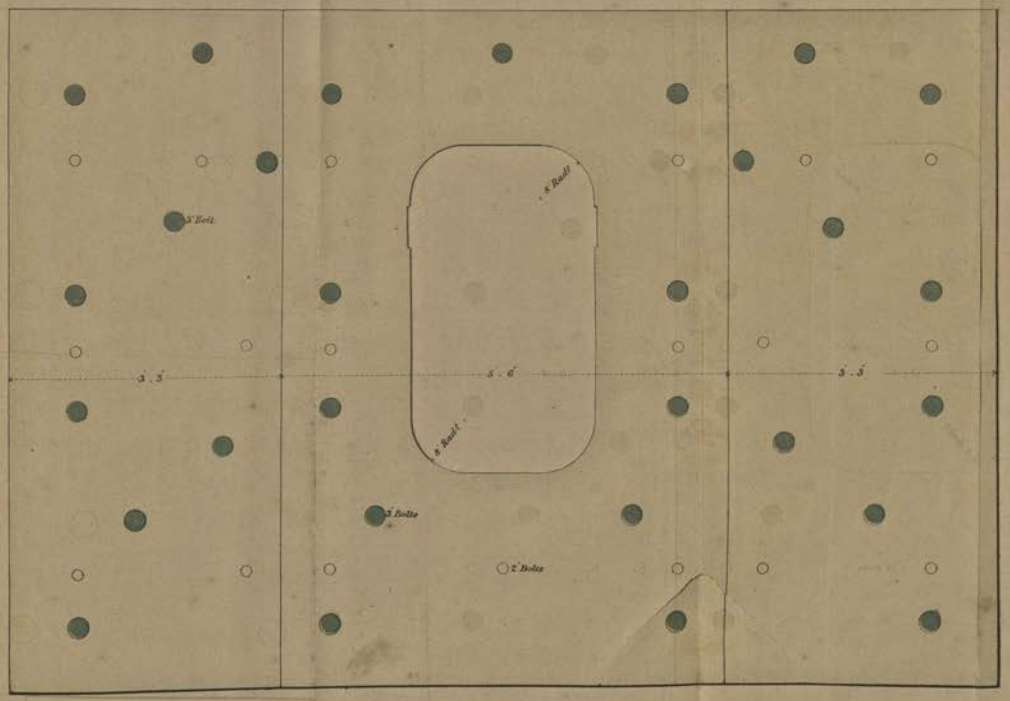
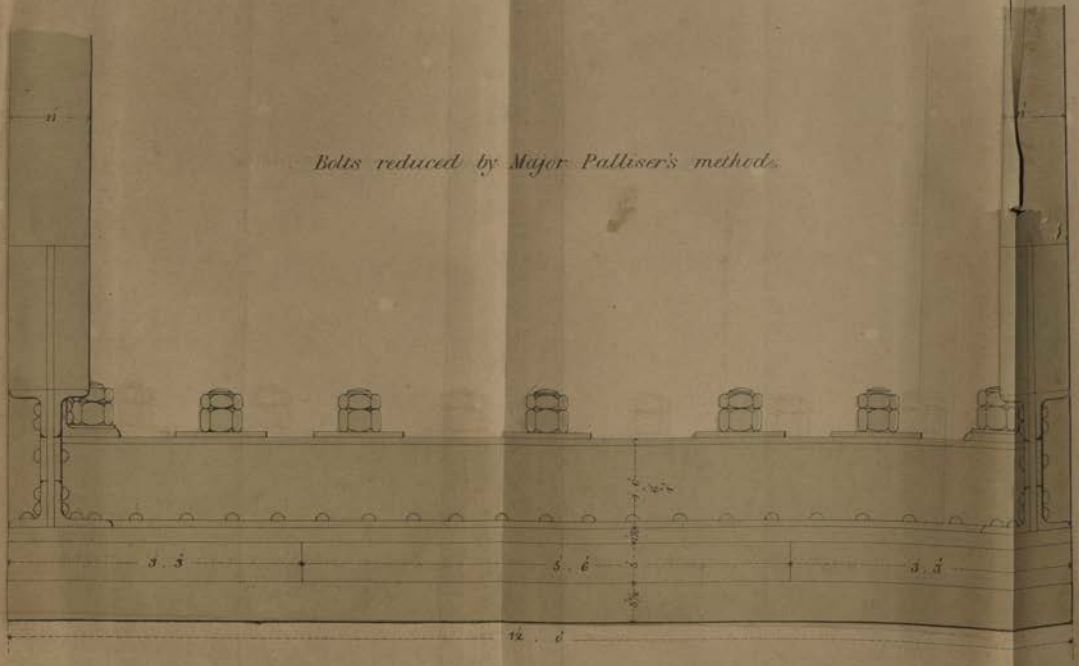


FRONT ELEVATION WITH ARMOUR PLATE REMOVED

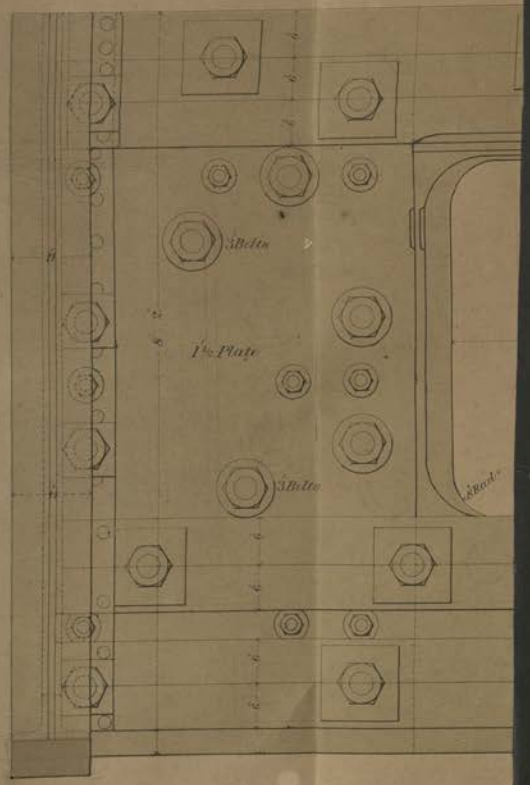
Scale 1 Inch=1 Foot

IRON SHIELD FOR COAST DEFENCES

A EXECUTED.



TOP PLAN.



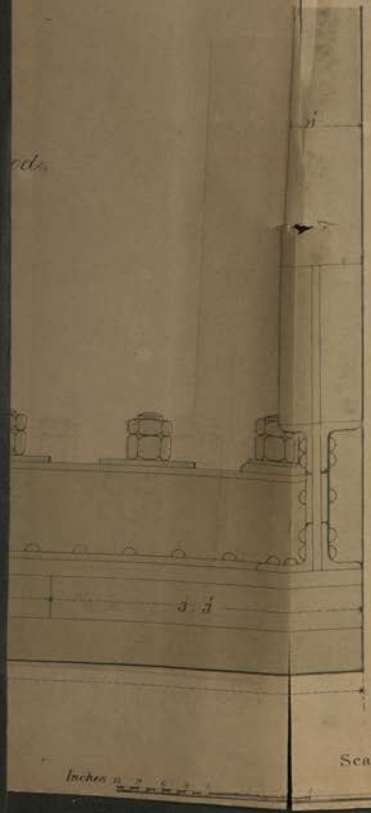
Scale 1 Inch-1 Foot.

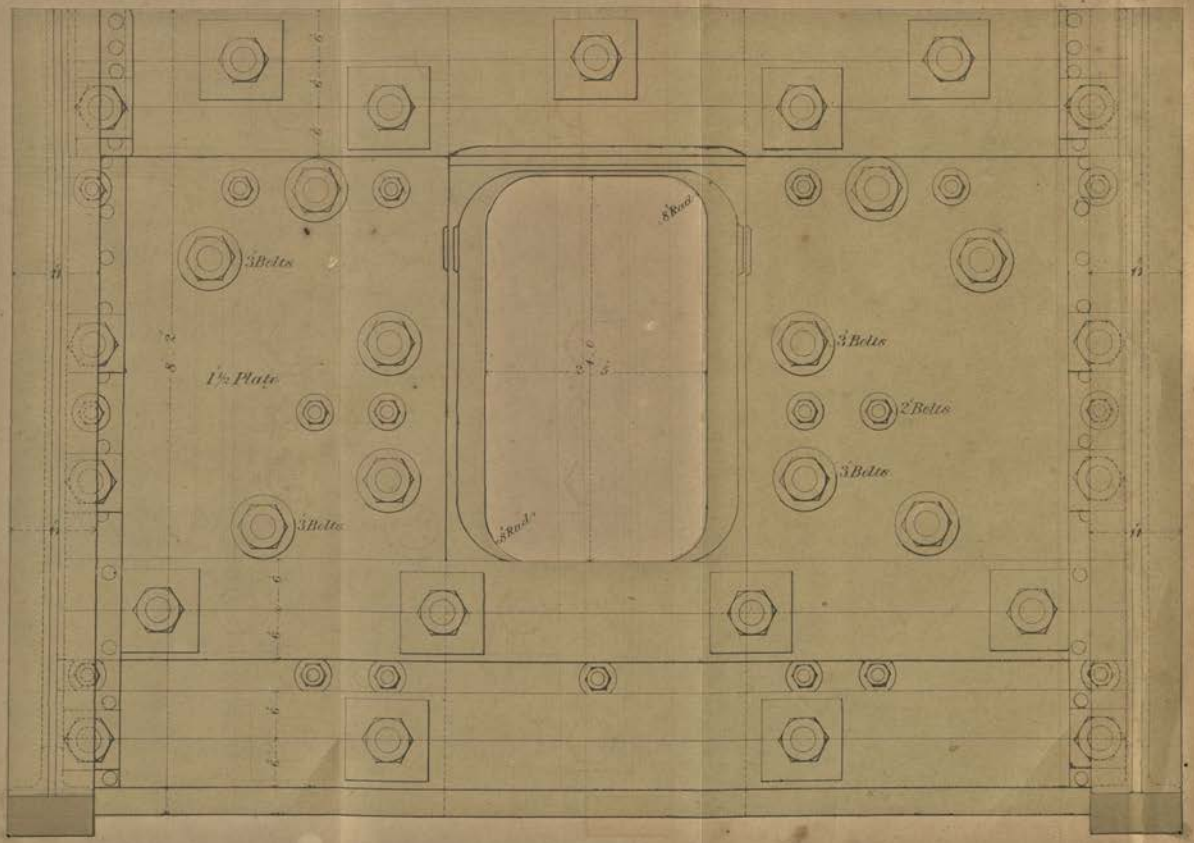
REAR

SHIELD FOR COAST DEFENCES.

A EXECUTED.

Wm F. Drummond Servis
December 1st 1866



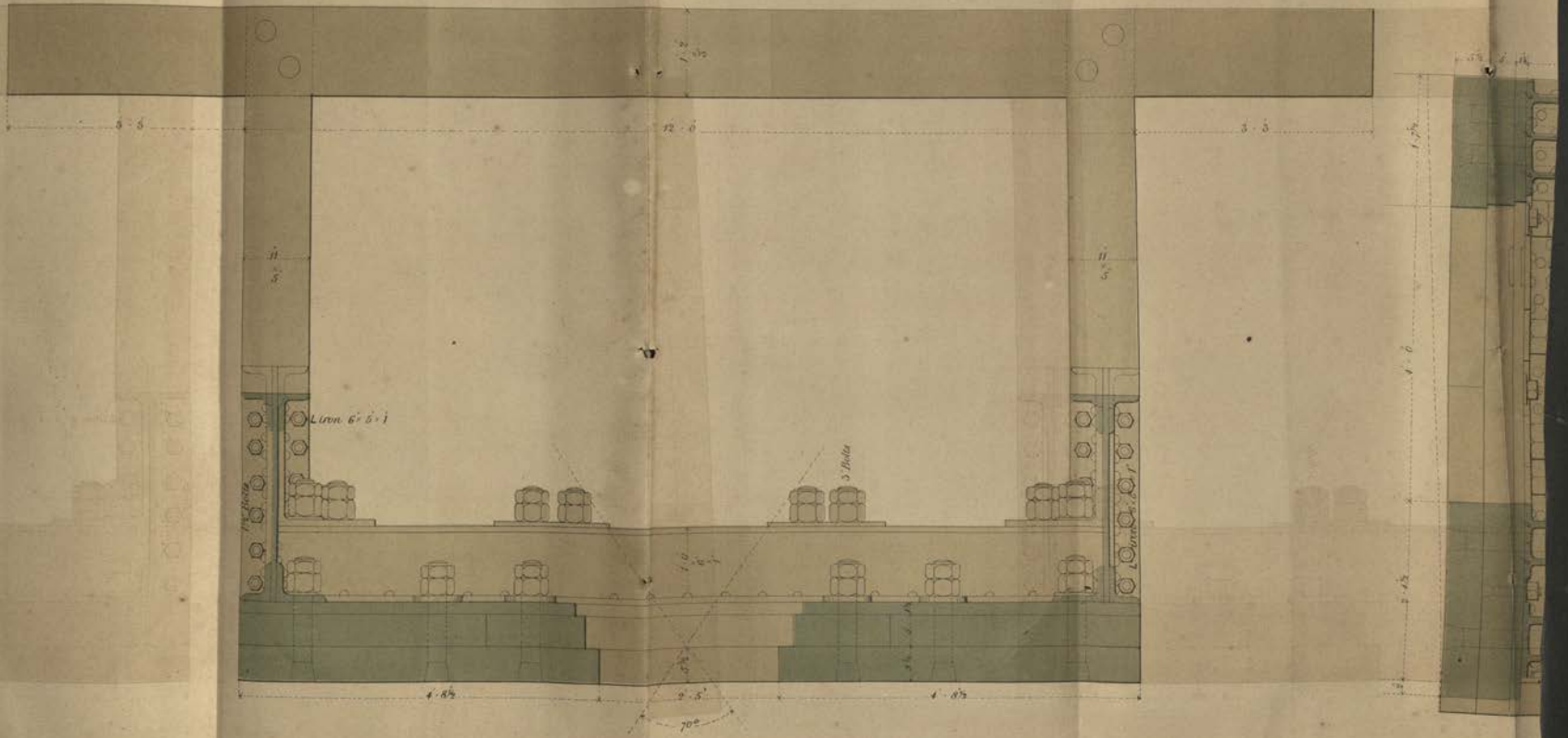


Scale 1 Inch-1 Foot.

REAR ELEVATION.

IRON SHIELD FOR COAST DEFENCES.

AS EXECUTED.



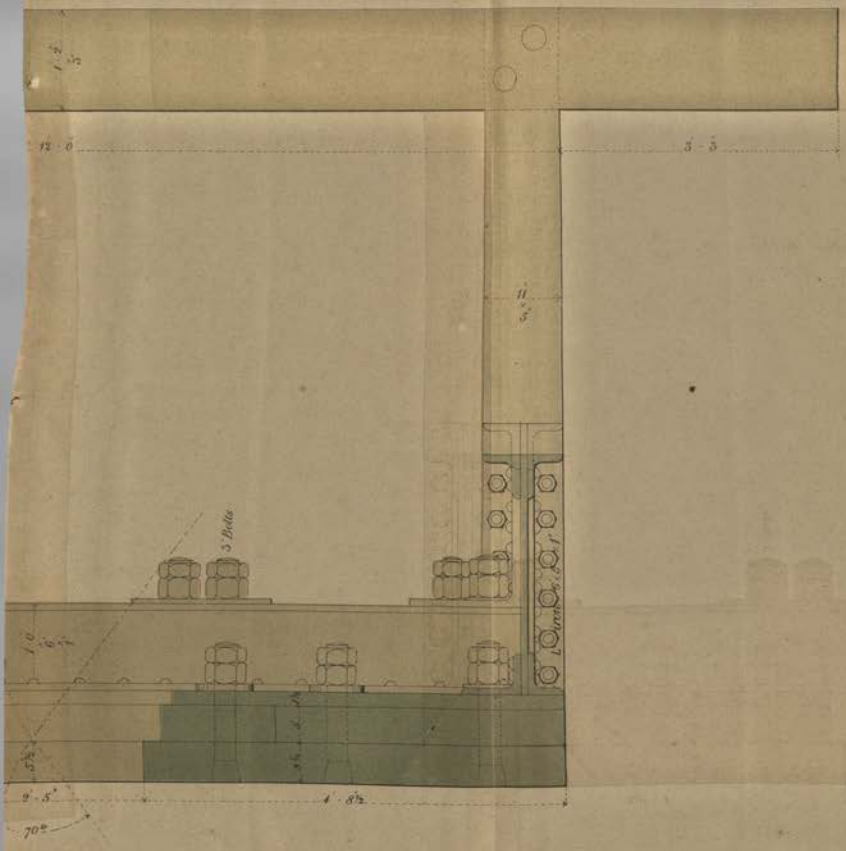
SECTIONAL PLAN THRO' EMBRASURE

Scale 1 Inch 1 Foot

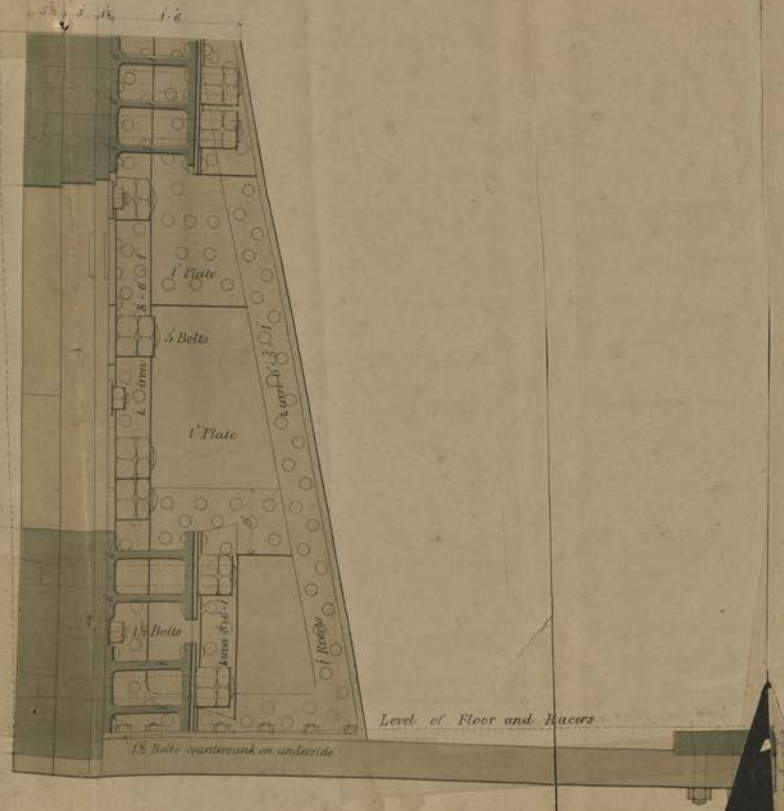
ON SHIELD FOR COAST DEFENCES.

AS EXECUTED.

Wm F. Drummond Servis
December 1st 1866



N THRO' EMBRASURE



Scale 1 Inch 1 Foot.

VERTICAL SECTION THRO'

APPENDIX No. V.

TARGET No. 30.

First Experiment on the "Gibraltar" Shield.

Shoeburyness, 25th October, 1867.

App. V.

First Experiment on Gibraltar Shield.

THE following Experiment was carried on by the Ordnance Select Committee against a Shield, representing an Iron Embrasure for a Casemated Masonry Coast Battery.

PRESENT:

Brigadier-General LEFROY, R.A., *President*.
Captain W. G. LUARD, C.B., R.N.
Colonel FREELING, R.E.
Lieutenant-Colonel G. SHAW, R.A.
Lieutenant-Colonel T. L. MAYNE, Unatt.
Major HEYMAN, R.A., *Secretary*.

The Shield is built up of three thicknesses of plates. The front plate, $5\frac{1}{2}''$ thick, is composed of two pieces, each measuring $12' \times 4'\ 1''$, their junction line being horizontal. The centre plate, $5''$ thick, composed of three pieces, the two outer measuring $3'\ 3'' \times 8'\ 2''$; the centre or port piece, $5'\ 6'' \times 8'\ 2''$, the junction lines of these plates being vertical. The skin plate is $1\frac{1}{2}''$ thick. The two thicknesses of armour-plates, and the skin plate are attached by 29 through-bolts $3''$ in diameter, and the $5''$ plate is further secured to the skin-plate by 19 bolts $2''$ in diameter. The $3''$ bolts are reduced in the shank on Major Palliser's principle, and have india-rubber and iron washers; the heads of the bolts are "upset." Below the port are four $12''$ |——| girders running horizontally, and above the port three similar girders; these girders are attached to the Shield by fifteen of the $3''$ bolts, and to the struts by angle-irons and rivets. The Shield is supported at each end by a strut consisting of plates and angle-irons; these struts are fastened by $1\frac{1}{2}''$ bolts to transverse beams $11'' \times 5'' \times 9'$ long, which are tied together by a longitudinal beam $14'' \times 3''$. Before the experiment they were weighted down at their ends by blocks of old iron. The Shield was further prevented from shifting by some piles driven into the ground in the rear of the transverse beam. A rope mantlet $2''$ thick, and of the same size as the shield, was suspended from the upper girder of the structure to catch the broken bolts and splinters.

The gun used in the experiment was:—

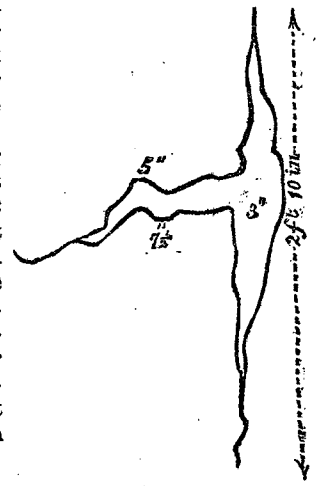
Nine-inch rifled muzzle-loading gun; weight, 12 tons; length, $12\frac{4}{12}'$; diameter of bore, 9·0"; twist, 0 to 1 in 45, increasing; 6 grooves, width 1·5", depth ·185".

App. V.
First Experiment on Gibraltar Shield.

Number of Round.	Photographic Number.	Nature of Ordnance.	Projectile.					Charge in lbs.	Elevation.	Range in Yards.
			Nature.	Weight in lbs.	Form.	Length.	Bursting Charge of Shell in lbs.			
1	1469	9" Rifled M. L. Gun ..	Palliser Shot	248	Head 1 D.	17"92	lbs. ..	37	20	70
2	1470	" "	"	"	"	"	..	"	"	"

App. V.
First Experiment on Gibraltar Shield

Radial Deviation.	Indent. Depth.	Indent. Diameter	Striking Velocity.	Remarks.
5° R	10·92	..	1276	Struck 3′ 6″ from right, 1′ 9″ from bottom; shot penetrated 10·92″, base 7″ out, most of body dropped off in front. In the bottom plate three bolts above hole two on level, and one below, gone; broken close to head. In upper plate three bolts broken above hole. The inner, or 1½″ plate, is forced away from 5″ plate ¼′. *In rear*, the shot had struck fair between two of the horizontal girders, the bottom one of which it broke through. The upper girder cracked in web and outer flange, and horizontally 7′ 9″, three inches from inner side; the third is also cracked through web and outer flange. Inside skin buckled and cracked; five small plate-bolts broken, and seven rivets sheared. The mantlet saved the nuts from being driven to the rear. The bottom plate is buckled 1¼″ in its whole length. Nos. of bolts broken—28, 30, 33, 36, 37, 40, 42, 44, and 47.
„	11·50	..	1275	Struck upper plate 3′ from left, 9¾″ from bottom. Shot penetrated 11½″, and partly broke up. Plate buckled 1·2″ below shot. Bolts broken on left side, Nos. 27, 29, 31, 34, 38, 39, and 41. *In rear*, the inner skin-plate is cracked through, and bulged skin about 6″ (*vide* sketch); the embrazure plate about 1″ (the shot having struck on the right edge of the former). The left inner plate is cracked through to right edge in wake of shot; opening of crack about 2¼″ on rear face; the crack extends for about 5¼″ horizontally along plate, then downwards for about 7″, ending about 11″ from right edge. The embrasure plate does not appear to be cracked at all. The top front plate has been pushed sideways in embrasure, and now overlaps the bottom one about one inch. The horizontal crack in web of girder opened out considerably on left of embrasure, the lower armour-plate is separated from inner 1¼″, and the upper one 1″. On left side the upper inner armour-plate is buckled forward 1″ at top, and ½″ at bottom. The outer armour-plate ⅝″ at top from inner, and outwards ½″ at bottom.



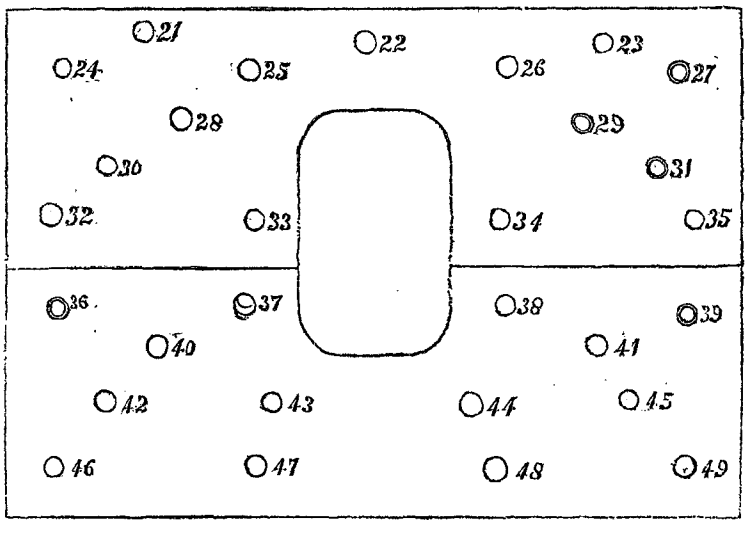
App. V. First Experiment on Gibraltar Shield.

LIST OF BROKEN BOLTS.

No.	Length.	Distance of Fracture from Head.
	Inches.	Inches.
39	20	3
33	20	$3\frac{1}{4}$
38	20	3
28	20	$2\frac{3}{4}$
42	$31\frac{1}{2}$	10
41	20	3
47	$31\frac{1}{2}$	$7\frac{1}{2}$
34	20	5
31	20	7
30	20	$2\frac{1}{2}$
40	24	3 and $8\frac{1}{2}$
36	20	3 and $5\frac{1}{2}$
37	20	3
44*	..	..
29*	..	..

* These two bolts were sent away by Lieutenant-Colonel Inglis.

No. 35 bolt, 20″ in length, was so much distorted by the nipping action of the plates, that it had to be cut in two at 6″ from the head before it could be taken out.



APPENDIX No. VI.

Shoeburyness, 1867.

App. VI.
Test of Samp
Plates of Gi
raltar Shield

THE following Experiments were carried on to test Armour for Fortifications, being Sample Plates of the Gibraltar Shields.

PRESENT [*4th January*]:

Colonel F. EARDLEY WILMOT, R.A.
Major INGLIS, R.E.
Lieutenant C. R. REEVES, R.A.
Mr. E. SACRÉ, for the Contractors, Messrs. Cammell & Co.

No. 1 Plate, $4\frac{1}{2}' \times 4\frac{1}{2}' \times 5\frac{1}{2}''$, against earth.

PRESENT [*28th January*]:

Major INGLIS, R.E.
Mr. E. SACRÉ, for Messrs. Cammell & Co.

No. 2 Plate, 5''; weight, 15 cwt.; supported against earth, and unsupported.

PRESENT [*8th February*]:

Colonel F. EARDLEY WILMOT, R.A.
Major T. INGLIS, R.E.
Captain H. J. ALDERSON, R.A.
Lieutenant C. R. REEVES, R.A.
Mr. SACRÉ.

No. 3 Plate, 8' 2'' × 5' 6'' × 5''; weight, 4 tons; supported against sand-bags, resting on wooden balks, and suspended by ropes.

At the 6th round the plate was suspended by ropes, unbacked and unsupported.

PRESENT [*26th February*]:

Colonel F. EARDLEY WILMOT, R.A.
Major INGLIS, R.E.
Captain H. J. ALDERSON, R.A.
Lieutenant C. R. REEVES, R.A.
Mr. SACRE.

No. 4 Plate, 12' × 4' 1'' × $5\frac{1}{2}''$; weight, 4 tons 16 cwt. The plate was swung by shackles to an iron bar, supported on the iron struts formerly belonging to Major Inglis' Shield.

PRESENT [*29th July*]:

Colonel F. EARDLEY WILMOT, R.A.
Lieutenant-Colonel T. INGLIS, R.E.
Captain H. J. ALDERSON, R.A.
Lieutenant C. R. REEVES, R.A.
Lieutenant ENGLISH, R.E.

No. 3 Plate, 8' 2'' × 5' 6'' × 5''; weight 4 tons; hanging free.

App. VI.

List of Samples of Gibraltar Shields.

PLATE

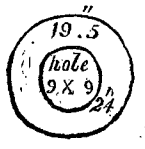
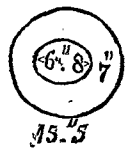
Number of Round.	Register Number.	Nature of Ordnance.	Projectile.					Charge in lbs.	Elevation.	Range in Yards.	Buckle.
			Nature.	Weight in lbs.	Form.	Diameter	Length.				
1	1	68-pr. Smooth-Bore ..	Cast-Iron Solid Shot	65·50	Spherical	7·9	..	16	4	70	·7
2	2	„ „	„	„	„	„	..	„	8	„	„
3	3	„ „	„	„	„	„	..	„	10	„	„
4	4	7″ Woolwich, No. 28 ..	PalliserShot	114·5	Cylindrical Head 1 Diameter	6·92	13·75	13	14	„	1·3

PLATE

1	5	68-pr. Smooth-Bore ..	Cast-Iron Solid Shot	65·5	Spherical	7·9	..	16	10	70	..
2	6	„ „	„	„	„	„	..	„	„	„	..
3	7	„ „	„	„	„	„	..	„	„	„	2·5
4	8	7″ Woolwich, No. 28 ..	PalliserShot	114·5	Cylindrical Head 1 Diameter	6·92	13·75	13	14	„	„

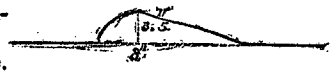
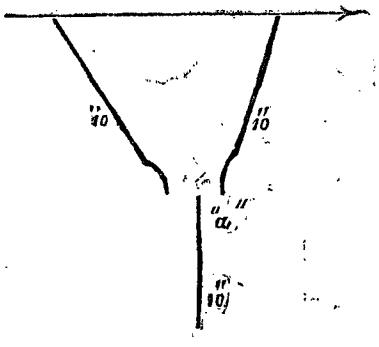
No. 1.

Shoeburyness, 4th January, 1867.

Effects.			Figure of Merit.	Remarks.
Depth of Indent.	Diameter	Ripple.		
2·8	9·7″ × 9·5	..	A 1	Struck 14·5″ from bottom, and 21·5″ from right; slight crack across face of indent. In rear, plate cracked over 14″, and bulged 2″.
2·5	9·4	..		Struck 11·5″ from bottom, and 29″ from right, 8″ from centre of No. 1; crack across face of indent. In rear, crack of No. 1 now extends 2′, bulge increased to 3″.
Thro gh	9 × 9	..		Struck on No. 1 and passed through, buckle not increased. In rear, plate torn away for 24″ × 19½″. 
„	7 × 7	2 At top		Struck 15·5″ from top, and 23″ from left, clean through; the plate itself is uncracked. In rear, plate torn away 17″, a bulge of 7″ in rear. The plate was warmed before commencing the practice. 

No. 2.

Shoeburyness, 28th January, 1867.

..	..	..	This Plate is decidedly harder than No. 1, but owing to its small size, it would be desirable to test a larger Plate of this batch before deciding on the figure of merit.	Struck 15″ from left, on bottom edge of plate, marking the plate thus—  In rear there is a large bulge of 1″ on the edge. The plate was supported against earth.
..	..	..		Struck just on the edge of No. 5, increasing the mark to 11″ in length, and making a slight crack in rear. The plate was unsupported.
2	9·5 × 9	..		Struck 7″ from bottom and 16″ from left, slight crack in the face of indent. In rear the plate is much cracked, thus—  The cracks at "*a*" 1″ wide. The plate was supported against a wooden balk which was broken by the blow.
..	..	..		Struck the plate 16″ from bottom and 5″ from right edge, and broke it. The plate was unsupported.

App. VI.

List of Sample Plates of Gibraltar Shields.

PLATE

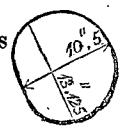
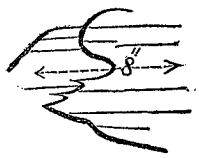
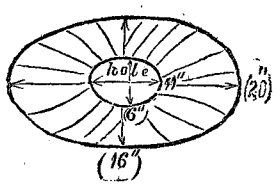
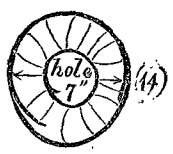
Number of Round.	Register Number.	Nature of Ordnance.	Projectile.					Charge in lbs.	Elevation.	Range in Yards.	Buckle.
			Nature.	Weight in lbs.	Form.	Diameter	Length.				
1	9	68-pr. Smooth-Bore ..	Cast-Iron Solid Shot	66·75	Spherical	7·9	..	16	0	30	·6
2	10	„ „	„	66·5	„	„	..	„	„	„	..
3	11	„ „	„	66·0	„	„	..	„	5	„	1·55
4	12	„ „	„	66·5	„	„	..	„	10	„	·8
5	13	7″ Woolwich, No. 28 ..	PalliserShot	115·5	Cylindrical Head 1 Diameter	6·92	13·75	9	„	„	·75
6	14	„ „	„	„	„	„	„	13	„	„	..
7	15	„ „	„	115·0	„	„	„	„	„	„	..

PLATE

1	16	68-pr. Smooth-Bore ..	Cast-Iron Solid Shot	66·5	Spherical	7·9	..	16	8	30	..
2	17	„ „	„	„	„	„	..	„	12	„	..
3	18	„ „	„	66	„	„	..	„	15	„	..

No. 3.

Shoeburyness, 8th February, 1867.

Effects.			Figure of Merit.	Remarks.
Depth of Indent.	Diameter	Ripple.		
2″·0	9½″×9½	″ ..	A 1	Struck 3′ 9″ from right and 1′ 9″ from bottom, buckle=·6″ over 6′ horizontal by 3′ 3″ vertical.
6·0	..	..		Struck on right-bottom corner of No. 9, hole measures  The face of indent is broken through.
2·7	9×9½	..		Struck just over No. 9, edges joining; buckle 1·55″ over 40″; indent slightly cracked on lower edge. (The effect of 9, 10, and 11 in rear, is a bulge of 6·5″, and plate cracked and broken over 14″ × 14″, with a hole through.
2·1	9½×9½	..		Struck 2′ 9″ from left and 2′ 6″ from top; buckle vertical =·8 over 40″. In rear, bulged 1·5″ with fine cracks  on bulge.
5·7	7×7	1·5		Struck 20″ from left 13·5″ from bottom, shot broken and remained in hole. Indent cracked thus— Buckle=·75″ over 36″.
Through	..	..		Struck right edge of No. 13, and passed through plate. Effect of 13 and 14 in rear; plate broken away. 
,,	..	..		Clean through just over No. 12. In rear, plate broken away round hole. 
				N.B.—The effect in the rear was not taken until the conclusion of the practice.

No. 4.

Shoeburyness, 26th February, 1867.

2·1	..	..	A 1	Struck 16″ from bottom and 5′ from right; buckle and indent 2·6″ over 40″. In rear, bulge 1·7″, the cracks run longitudinally about 11″. The cone fell 3′ 6″ in rear of plate, owing to the plate swinging back.
2·25	9½×9½	..		Struck 13″ from bottom, 4′ 3″ from right, 9½″ from centre of No. 16; the edges of the indents just touch; buckle and indent 3″ over 40″. In rear, bulge 2½″, the cracks join that of the previous round, and extend now over 21″. The plate swung back about 4′.
..	..	..		Struck on No. 17, and enlarged the hole a little; shot passed through. The vertical buckle on upper edge of hole = ·8″, on lower edge of plate 1·2″ over 6′. The plate swung back 2′ 10″. In rear the plate is broken away over 20″ × 18″, showing very good weld and fracture; there is a very slight appearance of imperfect weld.

App. VI.

Test of Sample Plates of Gibraltar Shields.

PLATE

Number of Round.	Register Number.	Nature of Ordnance.	Projectile.					Charge in lbs.	Elevation.	Distance in Yards.	Buckle.
			Nature.	Weight in lbs.	Form.	Diameter	Length.				
4	19	7″ Woolwich Gun, No. 28	Palliser Shot	114	Cylindrical Head 1 Diameter	6·92	13·75	10·25	13	70	..
5	20	„ „	„	„	„	„	„	10·50	„	„	..
6	21	„ „	„	„	„	„	„	11·0	„	„	..

PLATE

1	23	68-pr. Smooth-Bore ..	Cast-Iron Solid Shot	66	Spherical	7·9	..	16	15	30	..

No. 4.—*continued.*

Shoeburyness, 26th February, 1867.

Effects.			Figure of Merit.	Remarks.
Depth of Indent.	Diameter	Ripple.		
"	"	"		
..	..	..		Struck 3′ 10″ from right, 19″ from top, head of shot (a good chilled one) stuck in plate and remainder broke up; plate buckled on top edge $1\frac{1}{2}$″ over 6′, and cracked there slightly. In rear, plate broke away over 14″ × 13″, the point of the shot is just showing in centre of a small hole 2″ × 4″. The broken head of shot was knocked out by next round.
..	..	..	A 1	Struck 2′ 7″ from right and $8\frac{1}{2}$″ from top, head of shot remained in plate, body broke up. The plate is cracked through at top, the cracks extending down about 3″; the buckle on face of top edge over hole = 3″ in 6′, and $\frac{1}{2}$″ on the edge. Plate swung. In rear, the plate is broken away over 14″ × 8″, the point of shot showing through a hole measuring $4\frac{1}{2}$″ × 3″. The lamina is only broken away off half the bulge; the point of shot is nearly one inch further through than last; the crack through upper edge runs down to edge of bulge on back of plate.
..	$7\frac{1}{4} \times 7$	...		Struck 2′ 1″ from right, penetrated through; portion of base fell in front. In rear, the plate is broken away over $15\frac{1}{2}$″ × 15″.

No 5.

Shoeburyness, 29th July, 1867.

2·375	9 × 9	..	A 1	Struck 15·5″ from bottom and 16·5″ from right. Indent and buckle over 20 inches. Indent: Vertical „ 2·85 „; Horizontal „ 2·7 „ } over centre. Indent: Vertical „ 2·4 * „; Horizontal „ 2·35 „ } over centre. Buckle*: Vertical „ ·35 „; Horizontal „ ·35 and ·45 inches. In rear, plate is bulged and cracked; bulge 2″ over 12″ × 14″. * The above taken on edge of hole. The experiment was to ascertain the amount of penetration of a 68-pr., with the plate hanging free; for previous experiment, with plate supported, see report dated 8th February, 1867.

(Signed) F. EARDLEY-WILMOT, *Col. R.A.*,
Commandant and Superintendent.

APPENDIX No. VII.

Report on Second Trial of Gibraltar Shield.

App. VII.

Report by Mr. Baskcomb, to Controller, R.N., on Second Trial of Gibraltar Shield.

Sir, *Orchard Yard, Blackwall, 21st December*, 1867.

In accordance with your verbal directions of the 18th instant, I beg leave to report that on the 19th instant I proceeded to Shoeburyness, and witnessed the second trial of the Gibraltar Shield with the Woolwich 9-inch rifled gun, and the American Rodman gun, the range being 70 yards, and I have now the honour to report as follows:—

This shield is 12 feet in length by 8 feet 2 inches in depth, with a port-hole 2 feet 3 inches wide by 3 feet 11 inches deep, the total weight being 26 tons 12 cwt., and the weight per square foot equal to 667 lbs. It is composed of three thicknesses of plates, viz., outer armour-plate, 5½ inches, inner ditto, 5 inches, and a skin plating of 1½ inch, making altogether 12 inches of solid iron, supported at the back by 7 longitudinal girders of H iron, 12″ × 6″ × 1″, rivetted to skin plating, viz., three above and four below the port, together with a strong vertical bracket-knee at each end. The armour-plates were fastened to the skin plating with bolts on Major Palliser's principle, of 2¾ inches and 1½ inch diameter, respectively; the larger size being used for the front plate, and the smaller size for the inner plate. Since the first trial the holes in the skin plating and inner armour-plate have been rimed to 4 inches in diameter, to admit of a wood lining of ash being fitted around the bolts, and the inside edges of the holes in the front armour-plates have been rounded, the object being to prevent the armour-bolts from breaking at their shanks; and, with a view to prevent the nuts from jarring off by concussion, large elastic washers, composed of elm, cork, and canvas, 2 inches in thickness, were placed under the nuts; these means having been resorted to in consequence of the failure of the bolts at the first trial A mantlet of strong rope was also placed at the rear to catch splinters and bolts. The accompanying tracing will explain more fully the effects of the firing.

Round No. 1.—Palliser shot, weighing 248 lbs., ogival head, fired from the Woolwich 9-inch rifled gun, with a charge of 37 lbs. of powder. It struck the shield on upper plate, left of port-hole, at 20 inches from proper right end, and 2 feet from the bottom of the plate, penetrating the armour-plating, and causing the plates to bulge in the rear 2¾ inches, making a vertical fracture 12½ inches long and 1½ inch wide, breaking, at the same time, one of the larger armour-bolts at the nut, as also one of the smaller size. The armour-plates were disturbed, more or less, at their faying surfaces.

Round No. 2.—Palliser shot, weighing 251 lbs., with ogival head, also fired from the Woolwich 9-inch rifled gun, with a charge of 37 lbs. of powder. It struck the shield on the right side of the port, at 3 feet 6 inches from the proper left of the bottom plate, and 1 foot 11 inches from the bottom edge, penetrating the armour-plating, breaking 4 lower girders (one of them in 3 places), shearing and breaking 9 rivets, and also breaking off two of the smaller armour-bolts at the nuts.

Round No. 3.—This was fired from the Rodman gun, with 50 lbs. of English powder, and cast-iron spherical shot of 14·895 inches diameter, and weighing 451 lbs. It grazed the ground in front of the shield, and struck the bottom plate at 1 foot 11 inches from the proper left end, and 17½ inches from the bottom, making an indent of 3½ inches, and driving the shield back 5 inches at the proper left end. One of the larger and one of the smaller bolts were broken, and two of the girders broken by the last round were partially carried away. The broken pieces were driven back under the mantlet, to distances of 4 feet and 11 feet respectively, and the point of one of the larger bolts, with its nut, was driven to the rear about 58 feet.

Round No. 4.—Palliser shell, weighing 248 lbs., charge of powder 43 lbs., fired from the Woolwich 9-inch rifled gun; bursting charge of shell 2 lbs. 6 ozs. The projectile struck the lower plate at 3 feet 6 inches from the proper right end, the head of it passed clean through, carrying away a triangular piece of the front 5½ inch plate, and driving it 12 feet to the rear of the mantlet, the other plates being broken and bent inwards, as shown by sketch. Three of the larger bolts and two of the smaller were broken off, and also driven to the rear of the mantlet, one nut being carried to a distance of 36 feet.

Round No. 5.—Palliser's shell, weighing 245 lbs., charge of powder 43 lbs., from the Woolwich 9-inch rifled gun, bursting charge 2 lbs. 6 ozs. This shell struck the shield at the proper left of the upper plate, at a strong part of the structure, uninjured by previous firing, as will be seen by reference to sketch. One of the larger bolts was broken off at its head, and the plate broken through and opened one inch; one of the girders was also broken across, and the skin-plating slightly cracked,

I beg leave further to state, that the shield generally sustained very serious injury, the vibration caused by the impact of shot being so great, cracking and loosening the component parts of the structure, as to render it almost unfit for further experiment. Also the rope mantlet, which was intended to prevent splinters, &c., from being driven to the rear, was half destroyed at the conclusion of the firing.

I have the honour to be,

Sir,

Your most obedient servant,

W. B. BASKCOMB,

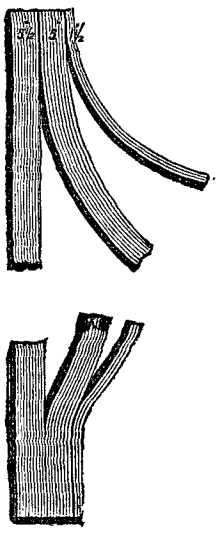
Overseer.

The Controller of the Navy.

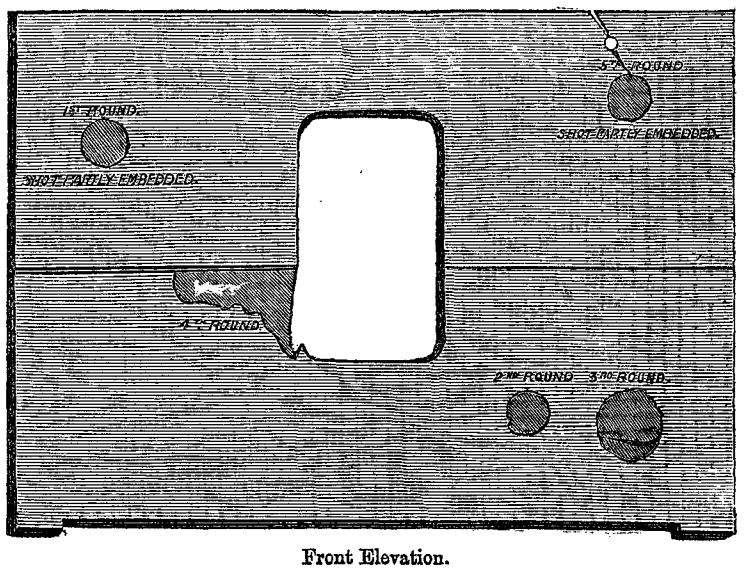
App. VII.

Report by Mr. Baskcomb, to Controllor, R.N., on Second Trial of Gibraltar Shield.

SKETCH showing the effect produced, on the Gibraltar Shield, by the firing from the Woolwich 9-inch, and Rodman Guns, during the Second Trial, on the 19th December, 1867.



Section at side of Port, showing effect of 4th Round on plating only.



Front Elevation.

APPENDIX No. VIII.

Shoeburyness, 28th November, 1867.

EXPERIMENTAL Practice continued against Test Plates bolted together.

PRESENT:

Colonel F. EARDLEY WILMOT, R.A.
Captain H. J. ALDERSON, R.A.
Lieutenant-Colonel T. INGLIS, R.E.
Lieutenant T. ENGLISH, R.E.
Mr. ELLIS.
Mr. BAYLEY.
Mr. JEVONS.

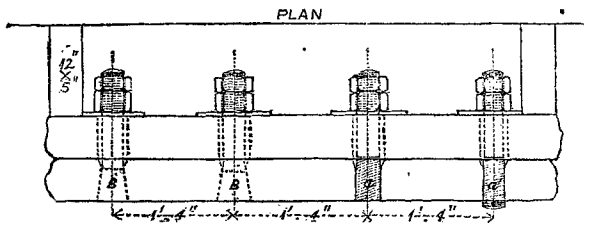
Description of Armour, and how Supported.

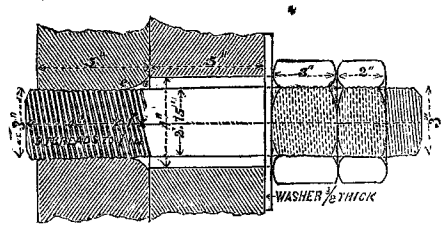
The target was composed of two 5″ plates bolted together, and supported by two vertical iron beams 12″ deep by 5″ wide; the iron beams rested against the 8″ target at their lower ends; 5′ up they were let into a horizontal wood baulk so that the rear edges of the beams were 8″ from face of target.

The plates were made by Messrs. Brown. Bolts and nuts by Messrs. Cammell.

Bolts Nos. 1 to 7 are screwed bolts, that is, they were screwed into front plate, and projected about 1″ from face of plate, the remainder were bolts of the ordinary shape, drawn down from a 4″ bar, head left at 4″, shank of bolt 2″·75, and 3″ in diameter at screwed part.

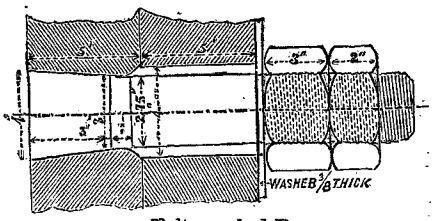
Nos. 3, 4, 5, 10, 11, and 12 had wooden and iron washers, the wood 1″ thick, next the plate; the remainder iron washers only. The bolt-holes in the rear plate are all 4″ in diameter, the bolts being packed up with wood; the rear edges of the bolt-holes in front plate only were rounded off.





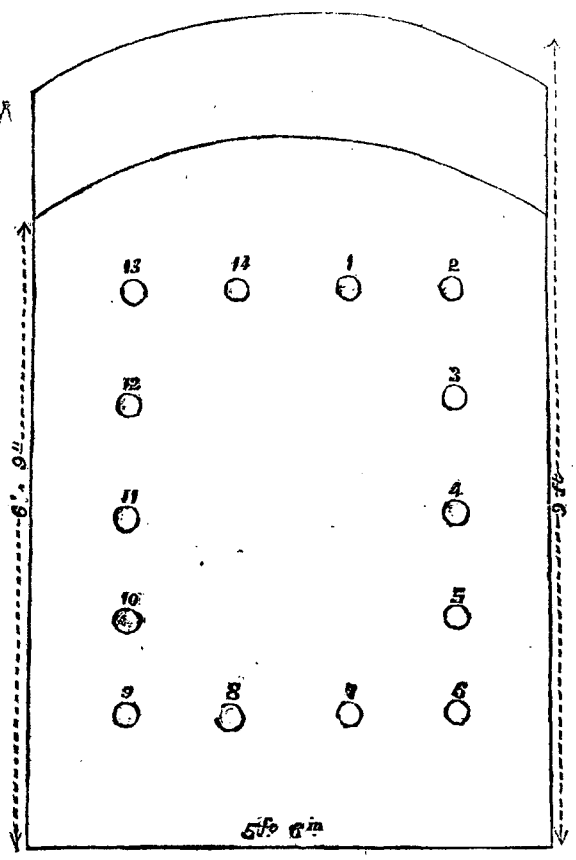
Bolts marked *a*.

The width of thread is gradually reduced from *c* to *d*.



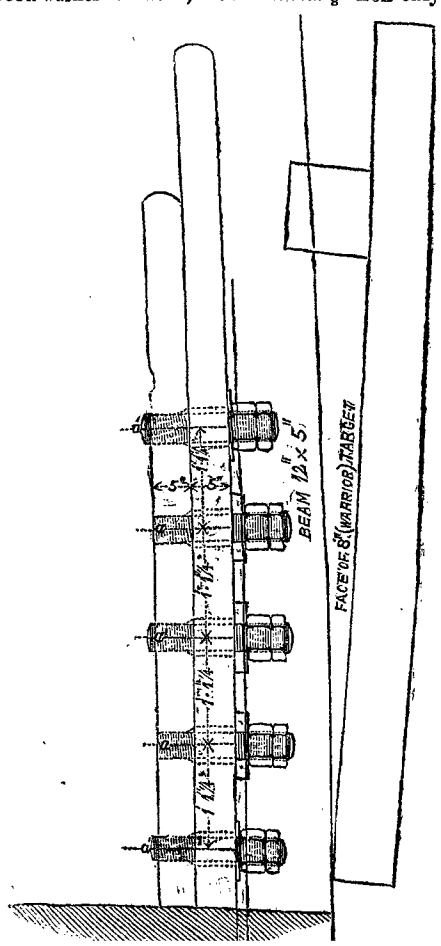
Bolts marked B.
Bolts ⅛ full size.

The three middle bolts on each side have ⅜″ iron, and wood washers 1″ thick, the remainder ⅜″ iron only.



ELEVATION.

The ends of the three bolts marked *a′* were drawn 1″ through face in order to allow the gradually reduced thread to bear in the front plate.



pp. VIII.
periment
est Fasten-

Number of Round.	Register Number.	Nature of Ordnance.	Projectile. Nature.	Weight in lbs.	Form.	Diameter	Length.	Charge in lbs.	Elevation.	Range in Yards.	Buckle.
1	115	9″ Rifled M.L. Gun of 12 Tons	Palliser Shot	246	Head 1 D.	8·92	17·92	25	30′	70	" ..
2	116	" "	"	"	"	"	"	37	20	"	..
3	117	" "	"	"	"	"	"	43	"	"	..

The following particulars were ascertained on the plates being separated.

Rear of Front Plate—

No. 117. The lip of the hole projected about 6″, area of bulge about 18″ × 20″.

No. 116. Point of shot projecting through hole 6″, area of bulge about 19″ × 24″, rear mould of plate is broken away above, and on right side of hole about $1\frac{1}{2}$″ × 4″ × 16″=

No. 115. Slightly bulged over about 15″ × 18″, the point of the shot penetrated the plate, making a hole 2″ × 2″ with radiating cracks.

Front of Rear Plate.

No. 115. The point of the shot just indented the plate about ·5″, but the plate is bulged back over 14″ × 17″ by the front plate, depth of bulge about 2″ to bottom of indent.

No. 116. Diameter of hole about 8″ × 6″, but the plate is bulged over an area of 2′ × 2′.

No. 117. Hole through plate measures 10″ × 12″.

Rear of Rear Plate.

No. 116. Hole through plate measures 8″ × 7″, and outer mould broken away over an area of 19″ × 24″, with radiating cracks.

No. 117. Hole through plate measures 12″ × 10″, and outer mould broken away over an area of 20″ × 23″, with radiating cracks.

Radial Deviation.	Effects. Depth.	Effects. Diameter	Remarks.
17 Left 3 Low	7″·5	..	Struck 2′ 2″ from left, 3′ 7″ from bottom, shot penetrated 7½″, point remained in plate (afterwards knocked out by No. 116), remainder of shot broken up. The shot appeared very grey, and was not chilled throughout. The front plate is cracked through to left edge, between Nos. 13 and 14 bolts, the crack begins 2½″ from left edge of hole, and is nearly ½″ wide.
8 Left 4 Low	13	..	Struck 2′ 4″ from right, 21″ from bottom, shot penetrated 13″, and remained in plate partly broken. The plate is much bulged and cracked round hole, and the part of plate below shot driven in about 1″. No. 7 bolt is broken, and No. 9 bolt, at nuts; No. 10 bolt-head is now drawn in 1″·2. The right-hand vertical supporting bar is buckled ·5″ between supports, namely in 5′, and the left one ·4″. In rear the plate is much bulged, and a large portion broken off (No. 116 knocked out point of No. 115).
7 Right 2 Low	Through	9½ × 9½	Struck 2′ 2″ from right, 4′ 1″ from bottom, centre of shot mark 15″ from No. 115. Shot passed through. Fresh cracks from right of hole through No. 3 bolt-hole to edge, crack through entire thickness of plate, and from left of hole to No. 115, and also at top of plate through rear moulds; No. 2 and 13 bolts are broken, No. 13 at end of conical part of head; No. 2 at screw-thread, 1″ inside front plate. Right beam bent over ·8″, left ·5″.

All the bolt holes in this plate are much ovalled, some nearly ·75″ (about 4″ is the average), on the outer edge of each of the holes, and in the line of the greater diameter is a scoop made by the bolt, showing the great strain and nip that must have been thrown on the latter by the movement of the plate. This effect is not noticeable in the front plate, owing to the edge having been rounded away.

After the experiment the bolts were removed from the plate. Their condition is as follows:—*

No. 1. Screw-bolt bent, commencing 5″·5 from head.
„ 2. Broken 4″·7 from front (piece left in plate), remainder slightly bent.
„ 3. Uninjured
„ 4. Slightly bent 5″ from front.
„ 5. Slightly bent 5″ from front, indent on opposite side 6″·5 from front.
„ 6. Indented 5″·7 from front, bent from that to end.
„ 7. Bend commences 4″ from front, broken off 11″ from front.
No. 8. Slightly bent at 5″ from front, head indented on side.
„ 9. Slight bend 4″ from front, broken off 10″·8 from front.
„ 10. Slightly indented, and bend 5″·5 from front.
„ 11. Bend 4″ from front.
„ 12. Large indent 4″·5 from front, and 5″·4 from front on opposite side.
„ 13. Head broken off, and bolt indented 4″·5 from front.
„ 14. Indented 5″·4 from front and bent.

(Signed) F. EARDLEY-WILMOT, *Col. R.A.*,
Commandant and Superintendent.

* It will be observed that in this Experiment no bolt was broken which had a wooden washer, and also that whereas two Palliser shot, fired from the 9-inch rifled gun with 37 lb. charges, broke sixteen 3-inch bolts at the Experiment on 25th October, 1867, two similar shot from the same gun, one fired with a charge of 37 lbs., the other with the full battering charge of 43 lbs., only broke four bolts.

A. HARRISON, *Capt. R.A.*,
Secretary, Special Committee on Iron Shields.

APPENDIX

RECORD OF RECENT EXPERIMENTS ON

Made by order of

Date of Trial.	Index No. of Bolt.	Material of Bolt.	Form of Head.	Head, How formed.	Diameter of Bolt.	Length of Nut, and Nature of Thread.	Nature of Trial.	Total No. foot tons applied.	Greatest Elongation of any one inch.	Greatest Contraction of Area, per cent.
1867. 7th Nov.	A 1	Staffordshire iron, S.C. Crown Brand, supplied for some of the Gun Shields for Gibraltar, and for the one experimented on at Shoeburyness.	Conical ...	Upset ...	3 in. diameter, reduced for 6 in. to 2·75 in. diameter.	3 in. and 2 in. nuts, 5 threads to 1 in.	20 cwt., falling 29 ft 6 in. on a block, 1,250 lbs. weight resting on the nut, and suspended by the bolt	29·5	inches. 0·0	0
5th ,,	A 2	,,	,, ...	,, ...	,, ,,	,, ,,	,, ,,	29·5	0·0	0
15th ,,	A 3	,, ,,	,, ...	,, ...	,, ,,	,, ,,	,, ,,	29·5	0·0	0
7th ,,	B 1	Fibrous iron, made at Cyclops Works, supplied for remainder of Gun Shields	,, ...	,, ...	,, ,,	,, ,,	,, ,,	88·5	not observed	9
7th ,,	B 2	,, ,,	,, ...	,, ...	,, ,,	,, ,,	,, ,,	88·5	0·0	0
7th ,,	C 1	Bessemer steel ...	,, ...	Drawn down	2·75 in. diameter ...	,, ,,	,, ,,	88·5	0·5	8
15th ,,	C 2	,,	Screwed...	...	,, ,, ...	,, ,,	,, ,,	88·5	0·33	25
7th ,,	D 1	Crucible steel, hardened in oil	Conical ...	Drawn down	,, ,, ...	,, ,,	,, ,,	88·5	0·5	5
15th ,,	D 2	,, ,,	Screwed...	...	,, ,, ...	,, ,,	,, ,,	88·5	0·2	9
7th ,,	E 1	Fibrous iron, made at Cyclops Works, to repair Gibraltar Shield at Shoeburyness	Conical ...	Drawn down	2·75 in. diameter, reduced for 3 in. to 2·6 in. diameter.	,, ,,	,, ,,	29·5	0·10	10
7th ,,	E 2	,, ,,	,,	,,	2·75 in. diameter ...	,, ,,	,, ,,	88·5	0·15	14
7th ,,	E 3	,, ,,	Screwed...	...	,, ,, ...	,, ,,	,, ,,	88·5	0·33	27
27th ,,	E 4	,, ,,	Conical ...	Drawn down	,, ,, ...	3 in. nut, 5 threads to 1 in.	,, ,,	88·5	0·45	32
27th ,,	E 5	,, ,,	,, ...	Upset ...	,, ,, ...	,, ,,	,, ,,	88·5	0·35	35
28th ,,	E 6 to E 12	,, ,,	,, ...	Drawn down	,, ,, ...	,, ,,	Three shot from 9in. Gun, charge 25, 37, 43 lbs.	about 8500	0·0 0·0	0 2
	E 13 to E 19	,, ,,	Screwed...	...	,, ,, ...	,, ,,	,, ,,	...	0·0	0

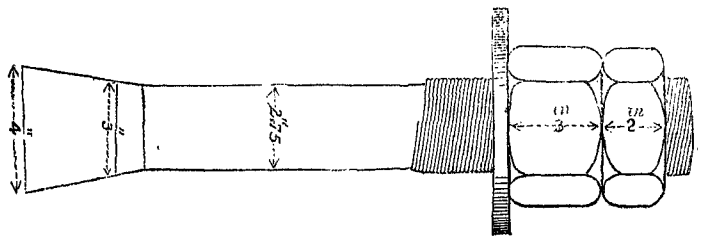
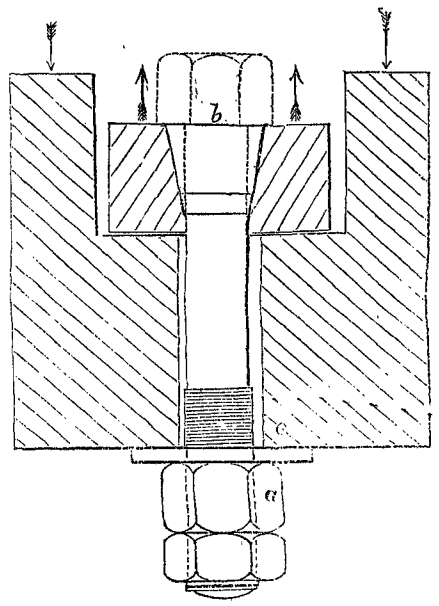
No. IX.

ARMOUR BOLTS UNDER IMPACT.

the Director of Works.

App. IX

Experiments on Armour Bolts under impact.

No. of Blows.	Point of fracture.	Nature of Fracture.	Remarks.
1	3·3 in. from head	Crystalline.	 Sketch of Bolt used.
1	"	"	
1	Edge of nut	"	 Section of Testing Apparatus.
3	Head half cracked through	½ crystalline	Drew the head through Armour Plate, which carried the bolt, reducing it from 4 in. diameter to 3·15 in. This was the first trial of the Testing Apparatus.
3	.....	.....	Drew head through Armour Plate, reducing it from 4 in. diameter to 3·15 in.
3	.....	.....	" " "
3	.....	.....	Drew head through Armour Plate, stripping the iron threads.
3	.....	.....	Drew head through Armour Plate, reducing it from 4 in. diameter to 3·6 in. This bolt had been cracked in tempering.
3	.....	.....	Drew head through Armour Plate, stripping the iron threads; cracked in tempering.
1	Reduced part of shank	¾ fibrous	Cracking at edge of nut.
3	.....	.....	Drew head through Armour, reducing it from 4-in. diameter to 3·06 in.
3	Edge of nut	Fine crystals	Bolt apparently breaking all over.
3	Shank	Fibrous	In this and all succeding trials the heads were prevented from drawing by the use of emery powder or paper.
3	"	"	
... 3	One at edge of nut; one in shank	Crystalline ¼ fibrous	Trial of two 5 in. plates bolted together. Three of these bolts had elm washers 1 in. thick. One of those not so provided was broken at the second shot, and one at the third.
3	One at edge of nut; one at end of screwed part in front armour plate	Crystalline	

RECORD OF RECENT EXPERIMENTS ON

Date of Trial.	Index No. of Bolt.	Material of Bolt.	Form of Head.	Head, How formed.	Diameter of Bolt.	Length of Nut, and Nature of Thread.	Nature of Trial.	Total No. foot tons applied.	Greatest Elongation of any one inch.	Greatest Contraction of Area. per cent.
									inches.	
1867. 4th Dec.	F 1	Fibrous iron, made at Atlas Works, for Fort Cunningham, Bermuda	Hexagonal	Collared ...	3 in. diameter, tapering to 2·80	One 3 in. nut, 5½ threads to 1 in.	20 cwt., falling 30ft.	20	0·0	0
4th ,,	F 2	,, ,,	Conical ...	Upset ...	2·8 in. diameter ...	,, ,,	,, ,,	120	0·75	55
4th ,,	F 3	,, ,,	,, ...	,, ...	,, ,,	,, ,,	,, ,,	90	0·19	12
4th ,,	F 4	,, ,,	,, ...	,, ...	,, ,,	,, ,,	,, ,,	30	0·0	0
4th ,,	F 5	,, ,,	,, ...	,, ...	,, ,,	,, ,,	,, ,,	150	0·62	37
11th ,,	G 1	Experimental iron, made at Atlas Works	,, ...	Drawn down	,, ,,	,, ,,	,, ,,	60	0·20	10
11th ,,	H 1	,, ,,	,, ...	,,	,, ,,	,, ,,	,, ,,	60	...	10
11th ,,	I 1	,, ,,	,,	,,	,, ,,	,, ,,	,, ,,	120	1·05	55
1868. 9th Jan.	J 1	Fibrous iron for experimental Front, made at Atlas Works	,,	,,	,, ,,	,, ,,	,, ,,	120	1·25	65
19th ,,	J 2 *a*	,, ,,	,,	,,	,, ,,	,, ,,	,, ,,	120	1·00	53
19th Feb.	J 2 *b*	,, ,,	,,	,,	,, ,,	,, ,,	16 cwt., falling 37ft.	60	0·10	9
9th Jan.	J 3	,, ,,	,,	,,	,, ,,	,, ,,	20 cwt., falling 30ft.	120	1·00	54
9th ,,	J 4	,, ,,	,,	,,	,, ,,	,, ,,	,, ,,	30	0·03	0·05
9th ,,	J 5	,, ,,	,,	,,	,, ,,	,, ,,	,, ,,	120	0·90	53
9th ,,	J 6	,, ,,	Screwed...	Nut at each end	3·3 in. diameter ...	3 in. nut, 5 threads to 1 in.	,, ,,	120	0·15	17
9th ,,	J 7	,, ,,	,,	,,	,, ,,	,, ,,	,, ,,	30	0·0	0
9th ,,	J 8	,, ,,	Conical ...	Upset ...	2·8 in. diameter ...	3 in. nut, 5½ threads to 1 in.	,, ,,	120	0·55	54
9th ,,	J 10	,, ,,	,, ...	,, ...	,, ,,	,, ,,	,, ,,	60	0·15	10
9th ,,	J 11	,, ,,	,, ...	Drawn down	,, ,,	,, ,,	,, ,,	30	0·0	0
9th ,,	J 12	,, ,,	,, ...	,,	,, ,,	,, ,,	,, ,,	120	0·70	37
9th ,,	J 13	,, ,,	,, ...	,,	,, ,,	,, ,,	,, ,,	120	0·50	48
9th ,,	J 14	,, ,,	,,	,,	,, ,,	,, ,,	,, ,,	40	0·03	0·06
9th ,,	J 15	,, ,,	Screwed...	Nut at each end	3·3 in. diameter ...	3 in. nut, 5 threads to 1 in.	,, ,,	120	0·15	16
23rd ,,	J 16 *a*	,, ,	Conical...	Drawn down	2·8 in. diameter ...	3 in. nut, 5½ threads to 1 in.	,, ,,	150	1·00	58
19th Feb.	J 16 *b*	,, ,,	,, ...	,,	,, ,,	,, ,,	16 cwt., falling 37ft.	90	0·25	15
31st Jan.	J 19	,, ,,	,, ...	,,	,, ,,	,, ,,	20 cwt., falling 30ft.	120	0·80	57
23rd ,,	J 20	,, ,,	,, ...	,,	,, ,,	,, ,,	,, ,,	90	0·25	20
12th Feb.	J 21	,, ,,	,, ...	,,	,, ,,	2½ in. nut, 5½ threads to 1 in.	,, ,,	120	0·80	48
12th ,,	J 22	,, ,,	,, ...	Upset ...	,, ,,	,, ,,	,, ,,	120	1·00	50
12th ,,	J 24	,, ,,	,, ...	,, ...	,, ,,	,, ,,	,, ,,	90	0·25	20
6th ,,	J 25	,, ,,	,, ...	Drawn down	,, ,,	,, ,,	26 cwt., falling 23ft.	90	0·15	16
12th ,,	J 26	,, ,,	,, ...	Upset ...	,, ,,	,, ,,	20 cwt., falling 30ft.	90	0·19	17
6th ,,	J 28	,, ,,	,, ...	Drawn down	,, ,,	,, ,,	26 cwt., falling 23ft.	120	0·31	25
6th ,,	J 29	,, ,,	,, ...	,,	,, ,,	,, ,,	,, ,,	90	0·19	15
31st Jan.	J 31	,, ,,	,, ...	Upset ...	,, ,,	,, ,,	20 cwt., falling 30ft	90	0·50	30
12th Feb.	J 32	,, ,,	,, ...	Drawn down	,, ,,	,, ,,	,, ,,	90	0·37	30
31st Jan.	J 33 *a*	,, ,,	,, ...	,,	,, ,,	,, ,,	,, ,,	120	0·87	48
12th Feb.	J 33 *b*	,, ,,	,, ...	,,	,, ,,	3 in. and 1 in. nut ...	,, ,,	90	0·05	2
19th ,,	J 34	,, ,,	,, ...	,, ...	,, ,,	3 in. nut ...	16 cwt., falling 37ft.	120	0·30	20
19th ,,	J 35	,, ,,	,, ...	Upset ...	,, ,,	,, ...	,, ,,	120	0·70	58
19th ,,	J 36	,, ,,	,, ...	,, ...	,, ,,	,, ...	,, ,,	120	0·55	42
14th Jan.	K 1	Fibrous iron, made at Millwall Works, for Plymouth Breakwater Fort	,, ...	,, ...	3 in. diameter, reduced for 6 in. to 2·8 in. diameter	3 in. and 1⅛ in. nut, 5½ threads to 1 in.	19 cwt., falling 24ft.	114	0·0	0
27th ,,	K 2	,, ,,	,, ...	,, ...	2·8 in. diameter ...	3 in. nut.	,, ,,	138	0·65	not observed

NOTE.—As all the bolts tested by falling weights were under similar conditions, the No. of foot tons applied will give a comparative measure of the work done in breaking the bolt in each case; the absolute amount of work absorbed by each bolt depending on the weight and distribution of material of the testing apparatus is not given in the above table, further experiments being required to determine it with any certainty.

ARMOUR BOLTS UNDER IMPACT—*continued.*

App. Experi on Arm Bolts u impact.

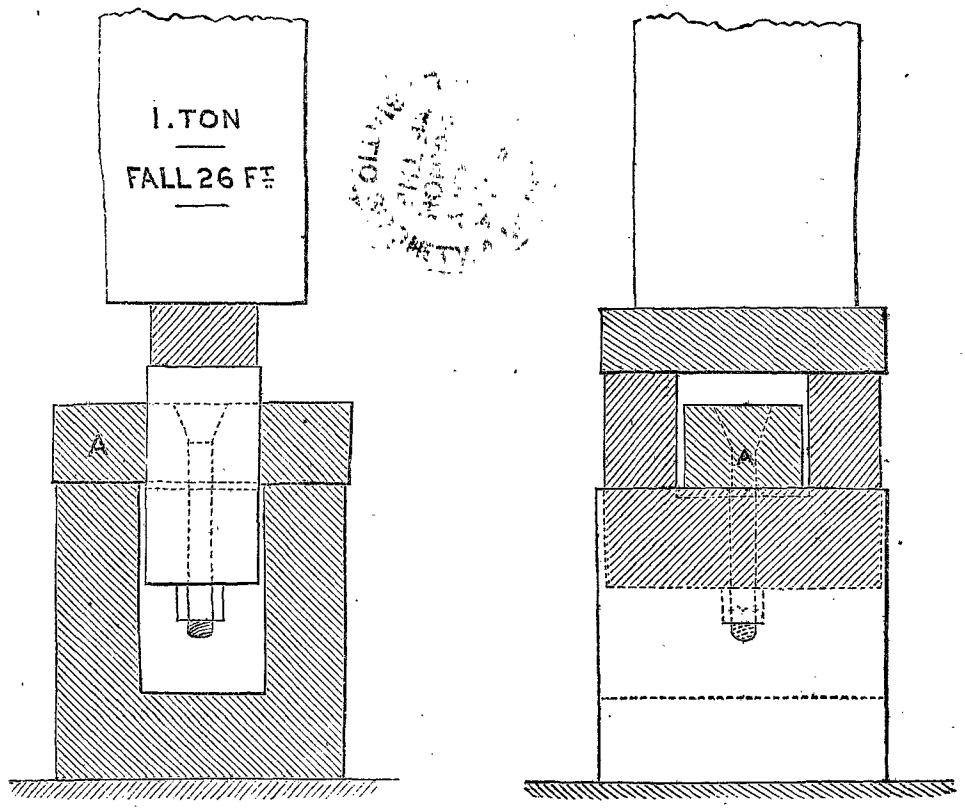
No. of Blows.	Point of Fracture.	Nature of Fracture.	Remarks
1	Upper edge of block	Crystalline	See sketch of Testing Apparatus, point *b*.
4	Shank	¾ fibrous.	
3	Close to nut... ...	Crystalline	Washer 1 in., of Clarkson's material, and iron washer ½ n. thick.
1	Edge of nut ...	,, ...	Elm Washer 1 in. thick and iron washer ½ in thick
5	Shank	Fine crystals ...	,, ,,
2	,, ...	,, ...	,, ,,
2	Shank	Crystals	Elm washer 1 in. thick, and iron washer ½ in. thick.
4	,, ...	Fibrous	,, ,, ,,
4	,, ...	,, ...	,, ,, ,,
4	,, ...	,, ...	,, ,, ... } same bar.
2	,, ...	Crystalline	,, 2½ in. thick, and dished iron washer 1 in. thick }
4	,, ...	Fibrous	,, 1 in. thick, and iron washer ½ in. thick.
1	Edge of nut... ...	Crystalline	,, ,, ,,
4	Shank	Fibrous	,, ,, ,,
4	Edge of lower nut ...	Crystalline	Elm washer at each end 1 in. thick, iron washer ½ in. thick.
1	Edge of upper nut ...	Crystalline	Elm washer 1 in. thick ,,
4	Shank	Fibrous	,, ,, ,,
2	Edge of nut ...	Fine crystals ...	,, ,, ,
1	,, ...	Crystals	,, ,, ,,
4	Shank	Very fine Crystals ...	,, ,, ,
4	,, ...	¾ fibrous	,, ,, ,,
2	Edge of nut ...	Crystalline	,, ,, , Weight slipped, first blow, at 10 ft. height.
4	Edge of upper nut ...	,, ...	,, , ,
5	Shank	Fibrous	,, ,, ... } same bar.
3	,, ...	Large crystals ...	,, ,, and dished iron washer 1 in. thick }
4	,, ...	Fibrous	,, ,, iron washer ½ in. thick
3	Edge of nut ...	Crystals	,, ,, ,,
4	Shank	Fibrous	,, ,, In this and succeeding experiments the threads of 3 in. nut were gradually reduced from the full thread, at ½ in. deep, to nothing at the edge.
4	,, ...	,, ...	,, ,, ,, ,,
3	.....	.....	Stripped nut ,, ,,
3	.....	.....	,, ,, ,,
3	.....	.....	,, ,, ,,
4	.....	.....	,, elm and dished iron washer
3	Edge of block ...	Crystals	See sketch of Testing Apparatus, point *c*, elm washer 1 in. thick, and iron washer ½ in. thick.
3	.....	.....	Stripped nut elm washer, and ½ in. iron washer.
3	.....	.....	,, ,,
4	Shank	Fibrous	,, } same bar.
3	.....	.....	Elm and dished iron washer; emery paper damp. Drew head through. }
4	,, ...	Crystals	Elm washer 1 in. thick, iron washer ½ in. thick, which broke first blow.
4	,, ...	Fibrous	,, ,, ,,
4	,, ...	,, ...	,, ,,
5	.....	.....	Drew head through; very little emery. These results are doubtful on account of the great friction of the apparatus which was not well adapted for the purpose.
6	,, ...	⅔ crystals ...	

APPENDIX No. X.

App. X. Experiment Armour ts under act.

Dear Sir, *Millwall, London, E., 5th February,* 1868.

KNOWING the Committee take an interest in everything connected with the subject of fortifications, I beg to acquaint you that the Royal Engineers have lately had two very interesting experiments conducted here upon the Bolts for the Plymouth Fort, with an apparatus which will be understood by the annexed sketches:—



I herewith send tracing showing the bolts before and after trial. These were manufactured on the plan adopted by the Admiralty, viz., by upsetting the iron to form the head.

No. 1 Bolt was reduced in the lathe on the original method of Major Palliser, and you will observe that the head has drawn through the Block A (in 5 blows), and become parallel, of the same size nearly as the shank of the Bolt, which remains uninjured.

No. 2 was reduced on what is termed Palliser's improved method; the body of the Bolt being turned parallel to the size of the bottom of the thread for about five inches, from which point it tapers regularly up to the size of the smallest part of the conical head, viz., 3 in. This Bolt received six blows before breaking, and was drawn from $2\frac{3}{4}$ in. diameter to $2\frac{3}{16}$ in. at the point of fracture, and stretched $3\frac{1}{2}$ in. in 14 in.

The results of these trials have fully borne out my evidence before the Committee that the iron is not injured in any way by upsetting; and further, I am of opinion that the bolt is rather improved than otherwise thereby, as it consolidates the iron in the head, making it stronger to resist "wire-drawing"; yet, in the case of No. 1 Bolt the head was too weak, and was, therefore, drawn through the block.

One great reason why the head of No. 2 Bolt was not also drawn through was that a thick coating of very coarse emery was put between the hole and the head, causing the surfaces in contact to cohere together and form, as it were, a solid mass of iron, but I question the utility of this expedient under the impact of shot.

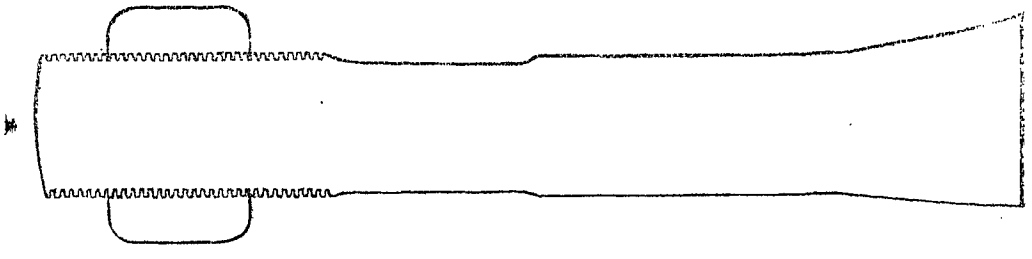
I remain,

Dear Sir,

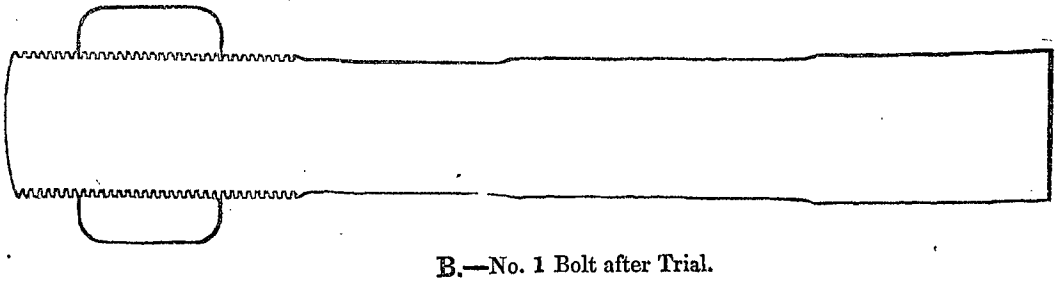
Yours faithfully,

JOHN HUGHES.

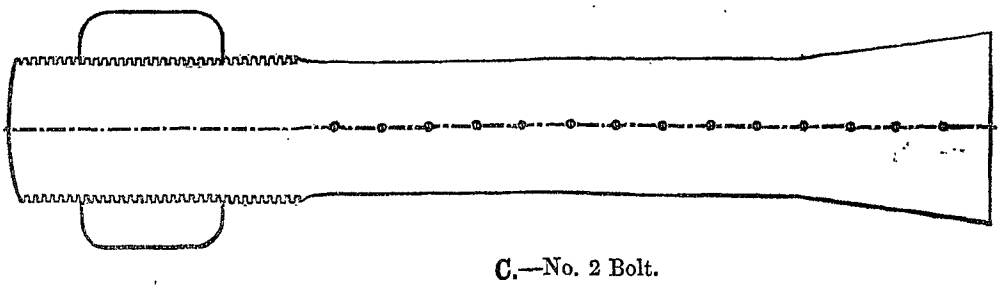
Captain Harrison, R.A.,
Secretary, Special Committee on Iron Shields.



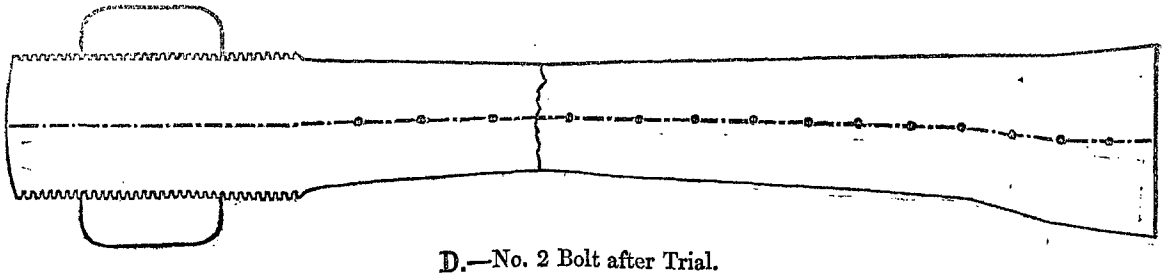
A.—No. 1 Bolt.



B.—No. 1 Bolt after Trial.



C.—No. 2 Bolt.



D.—No. 2 Bolt after Trial.

APPENDIX No. XI.

App. XI.

Armour Bolts which have been "upset" by impact of shot.

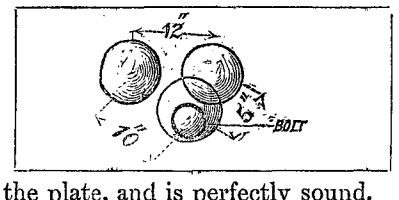
Millwall Iron Company, Millwall, London, E.,
7th January, 1868.

Dear Sir,

There has been a good deal said of late with regard to the iron in the armour-plate bolts being injured by "upsetting" to form the conical head, which I have always refused to admit, speaking from my own experience; and as I gave evidence on this subject before the Committee (which from the nature of the questions, and the way in which they were put, is not so clear as I could wish), I herewith forward you two bolts, one from the "Hercules" target and the other from the "Chalmers," referred to in my evidence. The first has been fairly struck on the head (I believe by a 300-pounder), yet it did not break it nor destroy the fibre, as will be readily seen by inspection. You will observe that this bolt has been actually "upset" (in a way I have never before witnessed) from 3″ diameter to about $3\frac{5}{8}$″.

The second bolt referred to was also fairly struck on the head by a 300-pounder shot which "ploughed" away half of it, and run along the bolt until it came in contact with the washer; on examination you will find that its fibre is still uninjured. I have seen a great many Millwall bolts similarly struck, and in no instance have they been broken in the cone.

One of the armour plates of the "Northumberland," tested at Portsmouth, is now lying at Millwall; this was struck by 3 shots in close proximity to each other, and the third came right on the head of one of the bolts, thus—



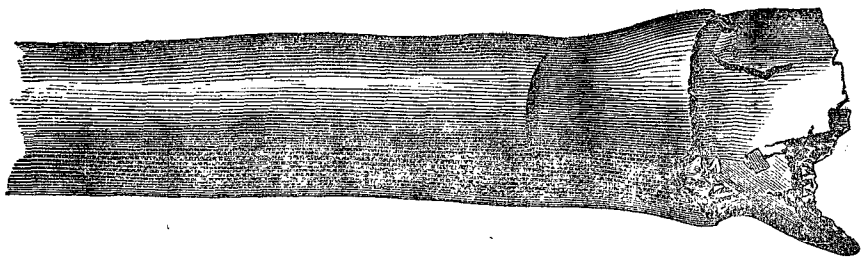
And it now remains fastened in the plate, and is perfectly sound. I should like the Committee to see this, so as to satisfy themselves of the correctness of my views.

I am, &c.
JOHN HUGHES.

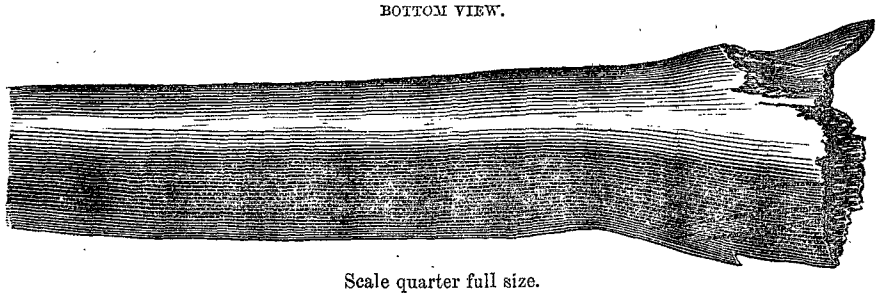
Captain Harrison, R.A.,
Secretary, Iron Shields Committee.

Armour-plate Bolt of the "Hercules" Target, manufactured at the Millwall Iron Works, showing that the fibre of the iron at the bolt-head has not been destroyed, although the head has been "upset" by the impact of a shot.

TOP VIEW.



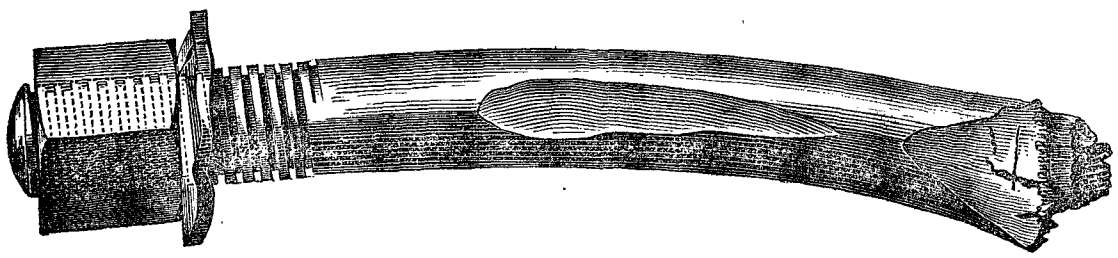
BOTTOM VIEW.



Scale quarter full size.

Armour-plate Bolt of the "Chalmers" Target, manufactured at the Millwall Iron Works, showing that the fibre of the iron at the bolt-head has not been destroyed, although the head has been "upset" by the impact of a shot.

TOP VIEW.



Scale quarter full size.

APPENDIX No. XII.

DURABILITY OF TEAK BACKING.

App. XII. Durability of Teak Backing

THE following Report was made to the Department of the Controller of the Navy, by the Master Shipwright of Portsmouth Dockyard.

"I had the teak backing behind the armour-plates thoroughly examined by boring, and trying the butts at the ports; it was uniformly found to be in good condition, neither were any defects found in the lower strakes of backing near the water's edge."

The "Erebus" is eleven years old, and was built at Glasgow by Napier.

(True Copy) A. HARRISON, *Capt. R.A.*,
Secretary, Special Committee on Iron Shields.

APPENDIX No. XIII.

App. XIII. Classification of Contract Plates and Planks, tested between Jan. 1867–68

RETURN of Contract Plates and Planks for Fortification Purposes which have been Tested at Shoeburyness between 4th January, 1867, and 21st January, 1868, showing their classification for quality.

Plates of various dimensions giving superficial areas of from 20 to 40 square feet, all 5 inches thick, except two in Class A. Fourteen tested.

In Class A (good)	.. ..	11
„ B (indifferent)	.. ..	2
„ C (bad)	.. ..	1
		14

Planks varying in length from 11 feet to 15 feet, and of section either $16\frac{1}{2} \times 5$ inches or 12×5 inches, all 5 inches in thickness. Forty-two tested.

In Class A	.. ..	18*
„ B	.. ..	15†
„ C	.. ..	9‡
		42

A. HARRISON, *Capt. R.A.*,
Secretary, Special Committee on Iron Shields.

* One of this number was experimental to guide manufacture.
† Six „ were „ „ „
‡ Two „ „ „ „ „

APPENDIX No. XIV

Her Majesty's Ship "Excellent," Portsmouth, 28th January, 1868.

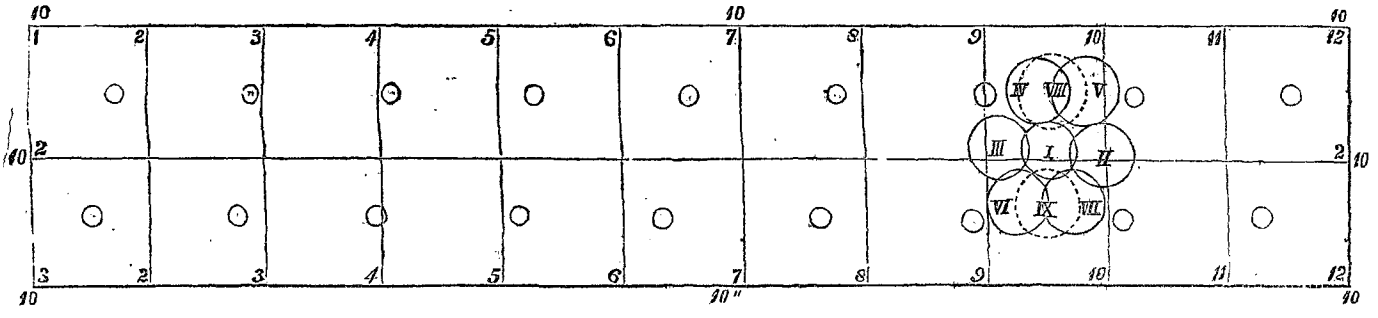
App. XIV.

Test of 10-in. Armour Plate.

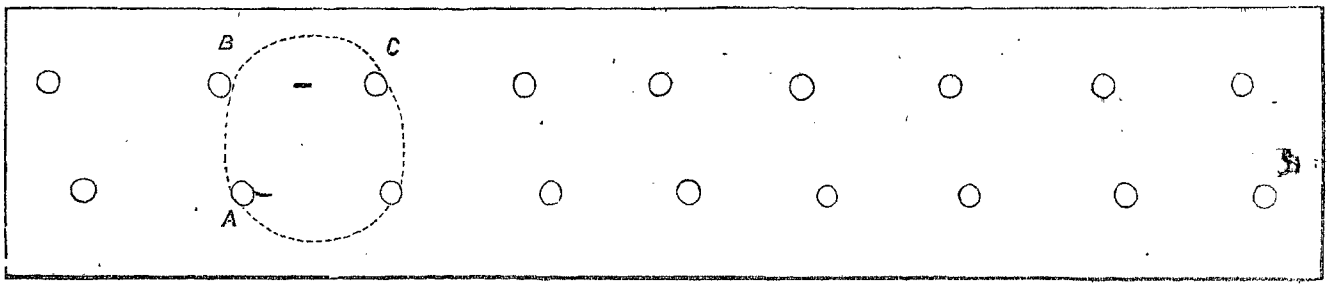
TRIAL of a 10-inch Armour Plate, supplied by Sir John Brown and Co., of the "Atlas Works," Sheffield, as a sample of those intended for the "Monarch."

The firing took place on board the "Thunderer." Gun, 68-pr.; charge, 16 lbs.; cast-iron shot. Temperature, 44°. Distance, 30 feet.

Front view of Sir John Brown's Armour Plate, 10 inches in thickness, tested on the 27th instant.



Dimensions, 19′ 1¼″ × 3′ 6½″. Scale, ½ an inch to a foot.



Rounds.	Distance from 1st Shot.		Depth.	Diameter	Remarks.
	Vertical.	Horizontal.			
	Inches.	Inches.	Inches.	Inches.	
1	..	..	1·7	9½	
2	¼ below	9¼ right	1·57	10	
3	½ above	9 left	1·67	10	
4	10 „	1½ left	1·7	10	Plate off at right end ⅛ inch.
5	10 „	6 right	1·71	10	
6	9 below	6 left	1·78	10¼	Plate off ¼ inch at right end.
7	9 „	3¾ right	1·86	11	
8	On junction of IV. and V.		1·82	..	
9	On junction of VI. and VII.		1·5	..	Top of plate bulged upwards $\frac{5}{16}$ths.

On removing the plate the back was found slightly bulged over a surface measuring 2 feet 5 inches horizontally by 2 feet 9 inches perpendicularly to a height of ¾ inch in rear of Nos. 4, 5, 8, and 6, 7, 9 impacts, and to ⅝ths inch in rear of Nos. 1, 2, 3.

One slight crack was found extending 2⅜ inches from A bolt-hole to a depth of 1¾ inch, and one very slight crack ½ inch long between B and C bolt-holes.

Figure of Merit, A 1.

A. W. A. HOOD, *Captain.*

APPENDIX No. XV.

1934. Iron Armour Plates.

App. XV.

Relative Penetrative Power of the 9-in. and 10-in. M.L. Rifled Guns, as calculated by Capt. Noble, R.A.

Captain W. H. Noble, R.A., 21/12/67, submits for record, with reference to Minute 23,351, the following abstract, showing the powers of the service 9-inch and 10-inch rifled M.L. guns.

Calculated by Hélie's formula on Minute 23,351, $\begin{cases} c = 0{\cdot}000062 \dfrac{R^2}{W} \text{ for 9-inch.} \\ c = 0{\cdot}000062 \dfrac{R^2}{W} \text{ for 10-inch.} \end{cases}$

9-inch M.L. Gun of 12 tons. Shot 250 lbs., 8·92 inch diameter. Head 1 D. Charge 43 lbs. Rifle L.G. V=1340.				10-inch M.L. Gun of 18 tons. Shot 400 lbs., 9·92 inch diameter. Head 1·25 D. Charge 60 lbs., Rifle L.G. V=1290.		
Distance.	*v.*	Total "energy" in	"Energy" per inch of shot's circumference.	*v.*	Total "energy" in.	"Energy" per inch of shot's circumference.
Yards.	Feet.	Foot tons.	Foot tons.	feet.	Foot tons.	Foot tons.
0	1340	3113	111·1	1290	4616	148·1
200	1303	2943	105 0	1264	4430	142·1
400	1269	2792	99·6	1239	4258	136·6
600	1236	2648	94·5	1215	4094	131·4
800	1205	2517	89·8	1192	3941	126·5
1000	1175	2393	85·4	1170	3797	121·8
1500	1108	2128	75·9	1118	3467	111·2
00	1047	1900	67·8	1070	3175	101·9

These results show:—

1. That 10-inch projectiles would strike a harder blow at 2,000 yards than the 9-inch would at the muzzle.
2. The power of perforation possessed by the 10-inch shot at 1,500 yards, is the same as that of the 9-inch at the muzzle.
3. The 10-inch chilled shot could perforate the shield fired 12/9/67 at 1,500 yards, provided it struck fair, and on the weakest part.

(True copy.) A. H.

APPENDIX No. XVI

Extract from Report of Ordnance Select Committee on Two Iron Shields for Embrasures, which were tested at Shoeburyness in 1865.

App. XVI.
Experiment on two Iron Shields in 1865.

The Committee have the honour to report their further experiments upon the granite casemate and iron shields erected at Shoeburyness in 1864, and which have been framed with a view—

(1) To ascertain the quantity and weight of fire from heavy rifled guns required to render such a structure indefensible, and (2) To enable a judgment to be formed on the relative value of granite and iron as applicable to the construction of works of defence.

2. The work subjected to attack represented two adjacent casemates on the ground tier of a fort, with their embrasures protected by iron shields. It was built of granite, in blocks of considerable size, which were disposed in seven courses. The largest block in the structure contained 104 cubic feet, the smallest 29 cubic feet. They would weigh about 7·7 and 2·2 tons respectively.

The whole was surmounted by a parapet wall of brickwork 3 feet 2 inches thick, and 3 feet 9 inches high.

The total frontage of granite was 45 feet to 43 feet (being on different courses).

	ft.	in.
Height of ditto	16	8
Height, including brickwork	20	5
Greatest thickness of granite in the piers	12	0
Least thickness	8	0
Total thickness, including brickwork	14	0

The vault over the right or east casemate, which represented an intermediate floor, was turned in four rings of bricks, total thickness 1 foot 7 inches, and was surmounted with a platform of concrete whose greatest thickness was 3 feet 6 inches. There was altogether 5 feet 6 inches of granite and 1 foot of concrete immediately over the shield; the total thickness over the vault was 2 feet 8 inches.

The vault over the left or west casemate was intended to be bomb-proof, and was turned in six rings of bricks; total depth 2 feet 4 inches, and surmounted by a platform of concrete 6 feet deep behind the granite, and 3 feet 9 inches deep over the crown of the vault.

The greatest height of the arch of the right or east embrasure was 8 feet 2 inches, length 12 feet. It was closed by an iron shield having an opening or port-hole 28 × 36 inches in the centre.

The shield was composed of three slabs of rolled iron 4 inches thick, behind which were 8 inches in depth of $\frac{7}{8}$ths inch iron plates placed vertically on their edges, then a 2-inch solid plate, next 6 inches of teak, and finally, a 1-inch iron plate; the whole being bolted together from front to rear and secured to a strong iron girder frame the base of which turned back horizontally, and was strongly attached by nuts to vertical bolts let into the granite.

The total thickness of this shield was 21 inches.

The left or west embrasure was finished in a flat arch, height 6 feet, width 6 feet.

It was closed by an iron shield, having an opening or port-hole 28 × 42 inches.

The shield consisted of a solid rolled iron plate 13½-inches thick, manufactured by Messrs. Brown and Co. It was secured at top and bottom by iron railway bars, let into the granite in the course of construction, and these horizontal bars were again tied by transverse bars cramped at each end and built into the granite.

The above dimensions are given in general terms.

3. The guns selected for the trial of the casemate were, in respect to calibre and weight, of a class that may be expected sooner or later to enter largely into the general armament of ships of war; none of them exceeded 12½ tons in weight. In these respects, therefore, they were fair representations of the power of an offensive fleet, and the effects produced by them on the structure may be taken as reliable data on which to base an opinion with regard to the comparative advantages of iron and granite (considered as to their powers of resistance only) as material for the construction of works of defence.

The guns, projectiles, and charges were as follows:—

Calibre.	Weight.			Charge.		Weight of Shot.	Striking Velocity.	
	Tons.	Cwt.	lbs.	600 Yards.	1,000 Yards.		600 Yards.	1,000 Yards.
Inches.						lbs.	Feet.	Feet.
10·00	12	2	57	41·3	36·0	280	1,273	1,209
9·22	12	2	56	39·5	30·25	220	1,395	1,322
8·00	6	19	50	26·0	22·0	150	1,369	1,292
7·00	6	19	72	18·0	..	115	1,370	..

4. The battery was placed at 200 yards from the casemate, but the charges were reduced, to give a striking velocity equivalent to 1,000 and 600 yards range, with the full service charges.

The fire was opened on the 16th November, commencing with one round of solid steel shot from each gun against each shield.

The results, as far as they can be traced before the debris are cleared away, may be stated in general terms as follows:

5. The compound iron and wooden shield in the east embrasure was struck fair by 13 shots, viz:—

			Yards.		Foot Tons.
7·0″	steel shot with velocity due to..	..	600	1	1,497
8·0″	„	„	1,000	1	1,736
9·22″	„	„	1,000	1	2,666
9·22″	„	„	600	2	5,938
9·22″	cast-iron shot	„	1,000	1	2,666
9·22″	steel shell	„	600	1	2,969
10·0″	steel shot	„	600	4*	12,584
10·0″	„	„	1,000	2	4,257
				13)	34,313
		Average blow ..			2,639

With the exception of a small piece which has been cut out of the lower sill, and the loss of about 3 square feet of the exterior plate which is broken off the right top corner and leaves the edges of the vertical plates exposed, this shield, although presenting a very battered appearance, is substantially entire.

It is, however, cracked through and through. Out of 37 armour bolts with their nuts and washers for securing the shield to the girder frame 11 are gone, as are the greater parts of the rivets of the frame itself; these would have formed splinters of a dangerous character; one bolt weighing 25 lbs. was thrown 28 feet to the rear. The shield is still in a condition to shelter a gun detachment, and would apparently stand several more blows.

The mode by which the girder supporting the shield is attached to the granite floor, namely, by 10 bolts passing through a sole plate, has proved sufficient for the purpose.

It has budged very little, but sufficiently so to have disturbed the pivot of the gun behind it, which became unserviceable after seven blows on the shield.

The inner skin is rent in several places, but no portion of it has come away.

6. The rolled 13-inch iron plate in the west embrasure was struck by 9 blows, viz:—

			Yards.		Foot Tons.
7·0″	steel shot with velocity due to..	..	600	1	1,497
8·0″	„	„	1,000	2	3,472
9·22″	„	„	1,000	1	2,666
9·22″	„	„	600	1	2,969
9·22″	cast-iron shot	„	1,000	1	2,666
10·0″	steel shot	„	1,000	1	2,838
10·0″	„	„	600	2	6,292
				9)	22,400
		Average blow ..			2,489

This shield then has received about two-thirds as much battering as the other, but considering that its surface is only one-third of the surface of the other, it may be said to have had the more severe trial of the two. It is completely cracked through in two places, and a portion on the left side between the two cracks appears ready to come away with a blow. It did, however, receive a blow from a 10-inch steel shot partly on the separated piece after it was cracked through without giving way.

* Half value is added for No. 1054, which glanced off the pier on to the shield.

App. XVI.
Experiment with two Iron Shields in 1865.

7. The Committee had intended further fire on both shields, but their steel shot are exhausted.

It is to be observed that the simple rolled iron plate possesses an important advantage in having no bolts, nuts, washers, or rivets to cause casualities in the work.

The west shield owes its attachment entirely to a system of bars of railway iron built into the granite, and held by other similar bars crossing them, and turned down as cramps. There are ten of these cramping bars above and below, of which five are broken.

This mode of fastening appeared amply secure, and it is perhaps the only way in which a thick plate in one mass can be held, but it has the disadvantage as compared with that employed for the other shield, that it forms a part of the structure, and there would be no means of replacing a wounded shield without extensive pulling down of the interior.

8. Considered as an embrasure the opening into which the west shield is inserted has the disadvantage of deflecting in shot that strike outside of it.

The Committee ascertained this by firing five 40-pr. segment shells so aimed as to impinge on the granite from each surface, right, left, under, and over. In every case some of the splinters or segments entered the casemate by the embrasure.

In one case the quantity that got in was sufficient to have been very destructive to the men both in the casemate struck and in the adjoining one, the segments having glanced off at an angle of about 45°.

The marks on the wooden screens were so close and so numerous as to make it difficult to count them.

The east embrasure, which is 12 feet wide, is not liable to these casualties, and was therefore not put to the same test.

The Committee do not think any iron shield should be less than 12 feet wide when recessed in stone openings of the general character of those they have tried.

* * * * * * * * * * *

15. The Committee have now to state the general conclusions they draw from the practice reported.

Both the iron shields have resisted well, and the fastenings of both may be said to be still effective, inasmuch as they have held them in their places to the last; those of the east shield are indeed hardly impaired. Those of the west shield have been weakened by the breaking off of three out of ten iron cramps, but the remainder continue to hold the plate; both shields continue to afford a fair amount of protection to the gun behind them, nor can anything be said to have got through them, although they are cracked through, bent, and started from the effects of the fire.

The east or compound shield (as shown above) has been struck 13 times to an aggregate amount of 34,313 foot tons, or 424 foot tons to every square foot of its actual surface when the port-hole is deducted.

The west or simple shield has been struck nine times to an aggregate amount of 22,400 foot tons, or 800 foot tons to every square foot of surface when the port-hole is deducted.

Total, 22 blows on the iron.

* * * * * * * * * * *

(True extract.) A.H.

EXPERIMENTS

ON THE

GIBRALTAR SHIELD

SUBSEQUENT TO THE

APPOINTMENT OF THE SPECIAL COMMITTEE ON IRON SHIELDS.

IRON SHIELD FOR COAST DEFENCES.

Upper line on the sections below represents front of shield, indents taken at distances of 1 foot from each other.

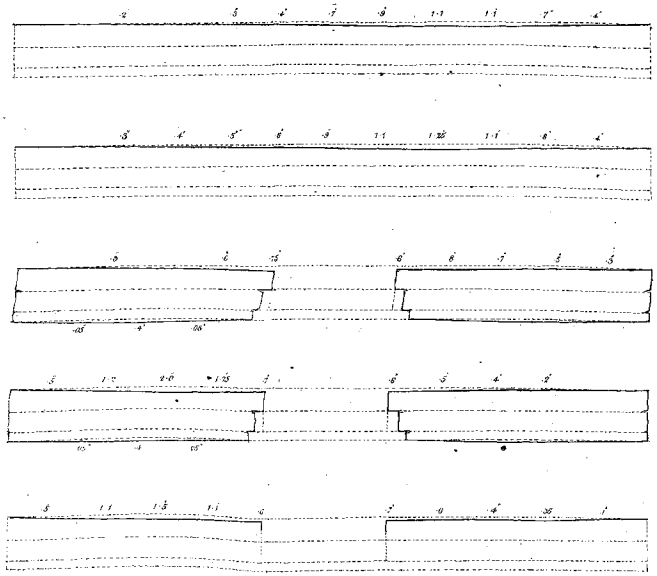
1 foot from ground.

30" from ground.

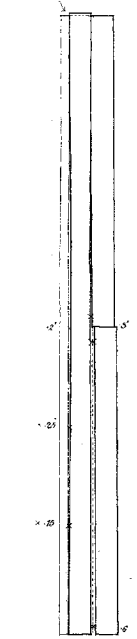
Top of plate.

Upper plate bottom.

Do 16" from bottom.

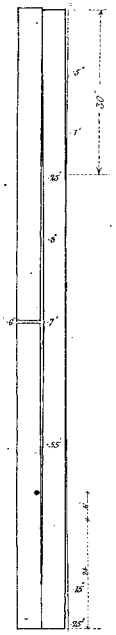


Front of skin

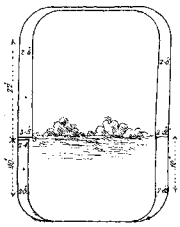


(PROPER) RIGHT SIDE OF SHIELD.

Front of skin



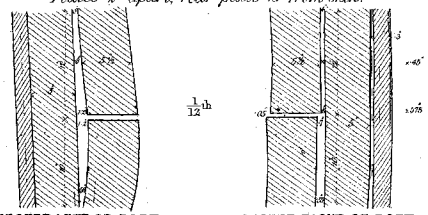
(PROPER) LEFT SIDE OF SHIELD.



VIEW LOOKING OUT OF PORT HOLE.

CENTRE OF PORT AT TOP.

Plates 2" apart, rear plate 15" from skin.



PROPER LEFT OF PORT. PROPER RIGHT OF PORT.

SILL.

Plates 6" apart, rear plate 15 from skin.

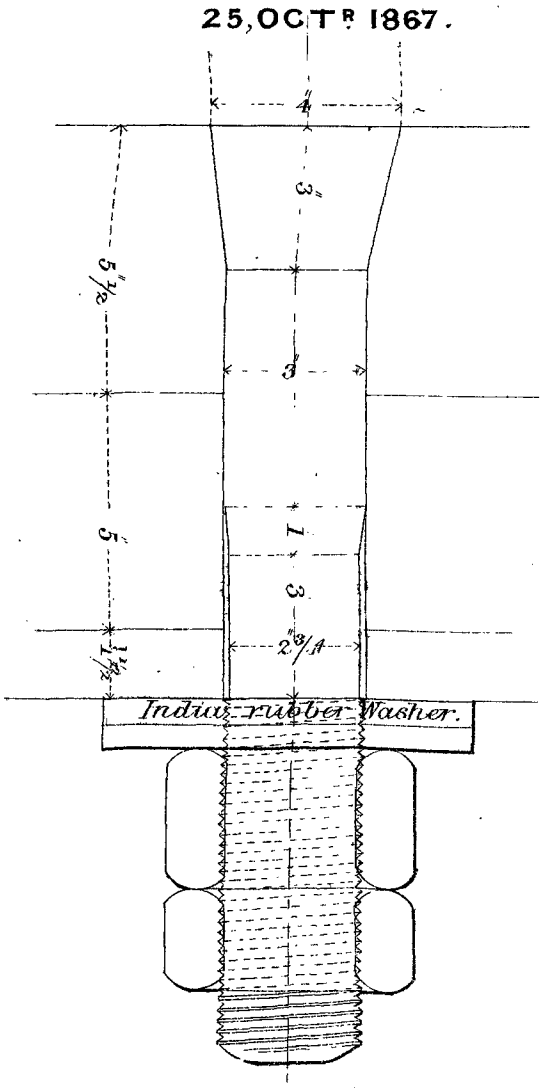
These measurements shew the condition of the Gibraltar Shield before the practice of the 19th Dec.r 1867.

GIBRALTAR SHIELD.

TRIAL.

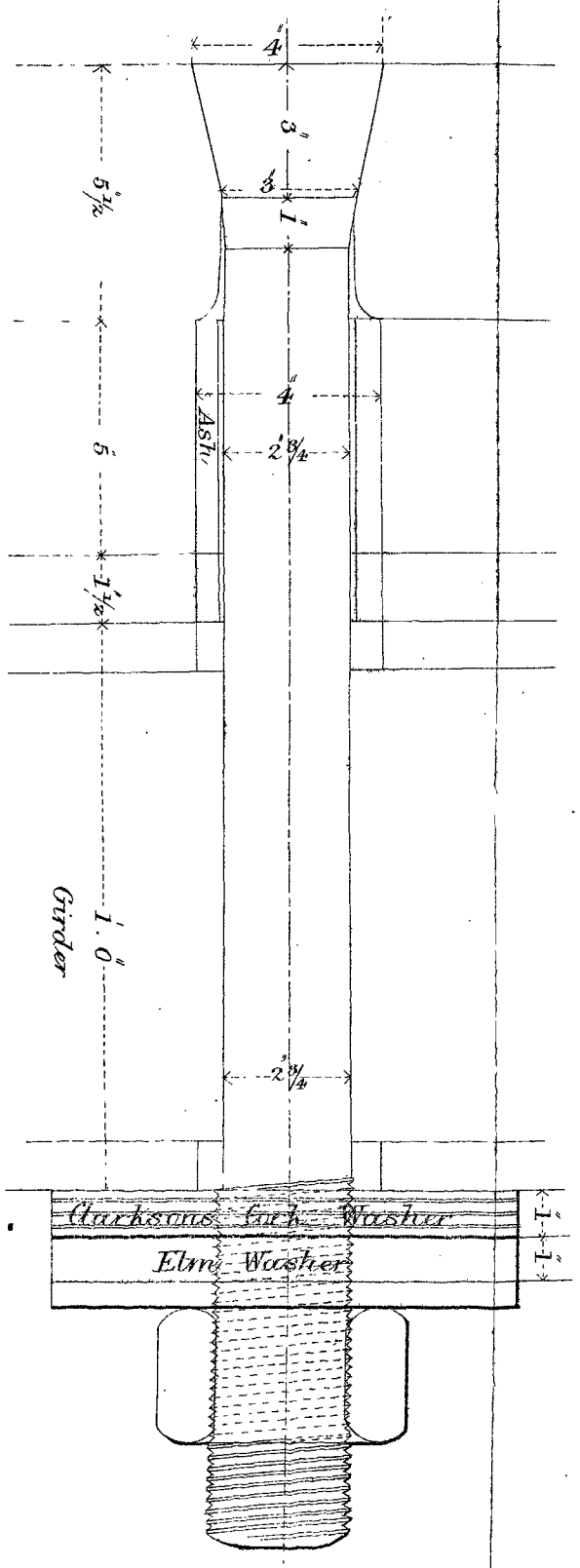
BOLT AS ON DAY OF FIRST TRIAL.

25, OCTR 1867.



BOLT AS ON DAY OF SECOND TRIAL.

19, DECR 1867.



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APPENDIX No. XVII.

TARGET No. 30.

Second Experiment on the "Gibraltar" Shield.

Shoeburyness, 19th December, 186

THE Experiment carried on at Shoeburyness, by the Ordnance Select Committee, on the 25th Octobe against the "Gibraltar" Iron Shield was continued.

PRESENT:

Rear-Admiral Sir JOHN HAY, Bart., M.P., F.R.S., *President.*
Major-General Sir W. GORDON, K.C.B., R.E
Colonel ADYE, C.B., R.A.
Lieutenant-Colonel WARD, R.E.
Dr. PERCY, F.R.S.
Dr. POLE, F.R.S.
Captain HARRISON, R.A., *Secretary.*

Since the last experiment on the Shield the following alterations have been made:—

The inner termination of the bolt-holes in the $5\frac{1}{2}''$ armour-plates have been rounded off to save the much as possible from the shearing action.

The 3″ bolt-holes in the 5″ and $1\frac{1}{2}''$ plates have been enlarged to 4″, and the bolts (reduced in $2\frac{3}{4}''$) are surrounded with a cylinder of ash-wood.

New 3″ armour-plate bolts, (Major Palliser's), have been substituted for those previously used. lterations consisting in the heads of the bolts being drawn out instead of being "upset," and the red $2\frac{3}{4}''$ in the shank extending throughout a greater length than previously. Emery was introduced r conical head of the bolts, to ensure a good grip.

Washers of Clarkson's "cork material" and of elm (1″ each), have been substituted for the thin Inc washer.

The 2″ bolts and rivets destroyed by the firing on the 25th October had not been replaced, and th with the exception of the alterations above enumerated, was in the same state as at the conc the preliminary experiment.

The shield was secured to iron plates, the ends of which were weighted with blocks of iron.

The weight of the shield is as follows:—

$5\frac{1}{2}''$ front plates, 8 tons 8 cwt. 14 lbs.: 5″ intermediate plates, 7 tons 10 cwt. 3 qrs. 14 lbs.; 2 tons 3 cwt. 3 qrs. 4 lbs.; struts, 2 tons 1 qr. 24 lbs.; |——| girders, 2 tons 8 c 17 lbs.; sill or floor beams, 2 tons 9 cwt. 3 qrs. 22 lbs.; bolts, nuts, washers, &c., 1 to 1 qr. 22 lbs.: making a total of 26 tons 12 cwt. 1 qr. 5 lbs.

The guns used in the experiment were:—

A 9-inch wrought-iron M.L. rifled gun; weight, 12 tons; twist in calibre, 1 in 45; 6 groove of bore, 125″.

A XV-inch Rodman cast-iron smooth-bore gun; weight, 19 tons 4 cwt. 2 qrs. 26 lbs.; b ponderance, 6 cwt. 1 qr. 7 lbs.; length of bore, 146·0″; length over-all, 176·1″.

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TARGET No. 30.

Second Experiment on the "Gibraltar" Shield.

Shoeburyness, 19th December, 1867.

App. XVII.

Second Experiment on Gibraltar Shield.

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Since the last experiment on the Shield the following alterations have been made:—

The inner termination of the bolt-holes in the $5\frac{1}{2}''$ armour-plates have been rounded off to save the bolts as much as possible from the shearing action.

The 3″ bolt-holes in the 5″ and $1\frac{1}{2}''$ plates have been enlarged to 4″, and the bolts (reduced in shank to $2\frac{3}{4}''$) are surrounded with a cylinder of ash-wood.

New 3″ armour-plate bolts, (Major Palliser's), have been substituted for those previously used. The alterations consisting in the heads of the bolts being drawn out instead of being "upset," and the reduction to $2\frac{3}{4}''$ in the shank extending throughout a greater length than previously. Emery was introduced round the conical head of the bolts, to ensure a good grip.

Washers of Clarkson's "cork material" and of elm (1″ each), have been substituted for the thin Indiarubber washer.

The 2″ bolts and rivets destroyed by the firing on the 25th October had not been replaced, and the shield, with the exception of the alterations above enumerated, was in the same state as at the conclusion of the preliminary experiment.

The shield was secured to iron plates, the ends of which were weighted with blocks of iron.

The weight of the shield is as follows:—

$5\frac{1}{2}''$ front plates, 8 tons 8 cwt. 14 lbs.: 5″ intermediate plates, 7 tons 10 cwt. 3 qrs. 14 lbs.; $1\frac{1}{2}''$ skin, 2 tons 3 cwt. 3 qrs. 4 lbs.; struts, 2 tons 1 qr. 24 lbs.; |——| girders, 2 tons 8 cwt. 2 qrs. 17 lbs.; sill or floor beams, 2 tons 9 cwt. 3 qrs. 22 lbs.; bolts, nuts, washers, &c., 1 ton 10 cwt. 1 qr. 22 lbs.: making a total of 26 tons 12 cwt. 1 qr. 5 lbs.

The guns used in the experiment were:—

A 9-inch wrought-iron M.L. rifled gun; weight, 12 tons; twist in calibre, 1 in 45; 6 grooves; length of bore, 125″.

A XV-inch Rodman cast-iron smooth-bore gun; weight, 19 tons 4 cwt. 2 qrs. 26 lbs.; breech preponderance, 6 cwt. 1 qr. 7 lbs.; length of bore, 146·0″; length over-all, 176·1″.

App. XVII.

Second Experiment on Gibraltar Shield.

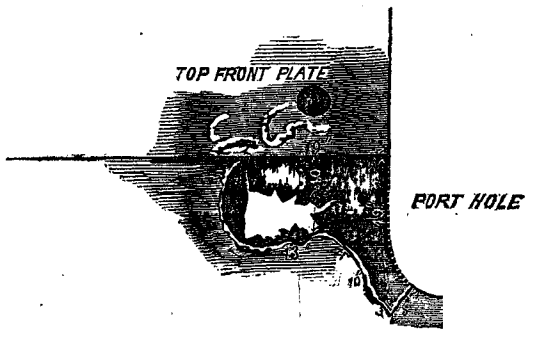
Number of Round.	Photographic Number.	Nature of Ordnance.	Projectile.					Charge in lbs.	Elevation.	Range in Yards.
			Nature.	Weight in lbs.	Form.	Length.	Bursting Charge of Shell in lbs.			
				lbs. oz.		″	lbs.		′	
1	1477	9″ Rifled M.L. Wrought-Iron Gun	Palliser Solid Shot	248 8	Head 1 D	18	..	37* R.L.G.	20	70
2	1478	,, ,,	,,	251 0	,,	,,	..	,,	,,	,,
3	1479	Rodman XV-inch Smooth Bore Cast-Iron Gun	Cast-Iron Solid Shot (American)	451 0	Spherical	14·895 Diameter	..	50†	P.B.	,,
1480		9″ Rifled M. L. Wrought Iron Gun.	‡Palliser Shell	248 0	Head 1·25″ Diameter	20	2·375	43	15	,,

* Equivalent to 43 lbs. (battering charge) at 400 yards range.

† English powder—equivalent to 60 lbs. American.

‡ Shell of "small capacity," the service shell contains a bursting charge of 5 lbs. 8¾ ozs.

Radial Deviation.	Effects. Depth.	Effects. Diameter	Striking Velocity.	Remarks.
..	10·	..	1283	Struck top plate of shield 2′ from bottom of upper plate and 1′ 8″ from right side; head of shot remained in plate, which buckled 1·4″ at edge of indent, and was driven in 1″ at bottom; 5″ plate started from skin plate 1″ at top and 0·2″ at bottom, and bottom of top front plate 0·7″ from 5″ plate. One large armour-plate bolt and one 2″ bolt broken at nut. At the back, vertical crack 12½″ long and 1½″ wide on skin plate, which was bulged out 2¾″; small crack 4″ long from a bolt hole. 5″ armour-plate cracked and bulged up to girder. Shield moved bodily to the right about 1·5″, and turned on its centre—right back, left forward. Two bolts securing sill piece at rear forced up. 8·2″ of base of shot broken off. Shot not well chilled, chill only extending about 1″ in depth. Mantlet bulged and opened out 2″ where struck by ends of bolts, *but was not penetrated.*
..	10·5	..	1276	Struck lower plate 3′ 6″ from left side, and 1′ 11″ from bottom of shield. Head of shot remained in target, 8″ of its length broken off. Shot well chilled. The head of shot was knocked out by No. 3 round, hole in armour-plate much cracked. Plate buckled 0·7″, extending over a length of 40″, also 1½″ at bottom, 1·7″ under proper left of port-hole, and vertically 1·2″ on right of shot and 0·8″ on left; front plate started from 5″ plate 0·6″ at top, 0·7″ at bottom. On the left side of port-hole the bottom 5½″ plate driven back 0·7″, and bottom of top plate 0·25″. 5″ plate started 0·3″ from skin. Nine rivets broken (eight being sheared off); two 2″ armour-plate bolts broken at the nut end. Wood sheathing round one bolt crushed up. At the back, the four bottom H girders broken through web and rear flange, close to and in line of the two armour-plate bolts 44 and 48, the top one in three places, the fracture extending over a length of 3′ 2″ of the web and through the flange, skin plate bulged and cracked vertically for a length of 3′ 6″ at 2′ 9″ from left side of target. The shield shifted 1″ to left, and was driven back 2·5″. Mantlet not damaged.
21″ (Low)	3·5	14	1157	Grazed 58′ short, and struck the lower plate of shield 1′ 11″ from left and 1′ 5·5″ from bottom; shot rebounded from shield and fell 10′ in front of it a good deal fractured and set up; it measured after impact 13·1″ striking surface to base, and 14·9″ in maximum diameter. Plate buckled 5½″ at indent over a length of 40″. Crack 11″ long and 1″ deep on bottom half of surface of indent. Edge of indent on a bolt, the head of which was much compressed. Vertical buckle of plate 6″; the plates separated as follows:—lower 5½″ from 5″, 1·3″ at top, and 0·6″ at bottom; 5″ from skin plate, 0·7″ at top. Right of shield shifted 3″ forward, and shield moved 5″ to the left. Eight rivets broken at left end of strut, and angle-iron at bend at bottom cracked. At the back, one large and one small armour-plate bolt broken, two of the H girders (broken by last round) carried away and driven to the rear—one piece 2′ 11″ × 11″, weighing 1 cwt., to a distance of 4′, another piece 1′ 10″ × 9·5″, weighing ¾ cwt., to 11′, the pieces passing *under* the rope mantlet. Eight rivets broken. Iron washer (8″ square) picked up 14′ at rear, and nut end of large bolt at 58′ from the rear of shield. Clarkson washers on four of the bolts, passing through the upper girders, compressed to half their thickness by the forcing out of girders. Skin plate bulged and cracked. The crack on skin plate made by No. 1478 extended into that made by No. 1470; four bolts, fastening inner bottom flange of strut to side, sheared off.
Deflection 7′ R.	Through	..	1329	Struck 3′ 6″ from right side of lower plate, at top of plate, penetrated shield, and burst in going through; piece of 5½″ plate, 1′ 7″ × 1′ 7″, broken off and driven through port-hole to 12′ in rear, hole extended to port-hole, and measured 1′ 9″ in its greatest length (*see sketch*); 5″ plate and skin plate broken through, day-



Scale $\frac{1}{24}$th.

light visible, a crack joins bottom of hole with No. 1469; one large bolt, struck by shell, broken and driven in; bolt in bottom row of upper plate (above hole) broken at neck, and lying at front of shield; bolt in second row of lower plate

XVII.
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Number of Round.	Photographic Number.	Nature of Ordnance.	Projectile.. Nature.	Weight in lbs.	Form.	Length.	Bursting Charge of Shell in lbs.	Charge in lbs.	Elevation.	Range in Yards.
				lbs. oz.			lbs.			
4 *cont.*	1480	9″ Rifled M. L. Wrought-Iron Gun	Palliser Shell	248 0	Head 1·25″ Diameter	20″	2·375	43	15′	70
5	1481	,, ,,	,,	245 0	,,	..	2·562	..	..	,,

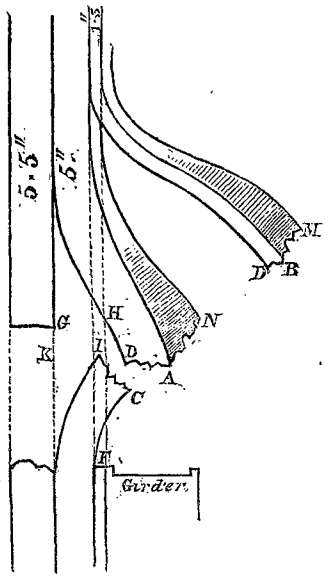
Rounds Nos. 1 *and* 2 were Palliser solid shot of 250 lbs., fired from a 9-inch 12-ton gun, with a reduced charge of 37 lbs. to represent the striking velocity due to a battering charge at 400 yards range. The penetration in each case was about 10 inches, eight inches of the base of the shot being broken off and the head remaining in the shield. The skin plate was bulged and cracked by each shot, and the second shot, which struck the shield in the line of the lower H girders, damaged them considerably. The 1st round broke one large and one small armour-plate bolt, and the 2nd round two small armour-plate bolts and nine rivets. The shot had a striking velocity of 1,283′ and 1,276′ respectively, and an "energy" equal to 10¼ foot tons per inch of shot's circumference, the "work" on impact amounted to 2,835 foot tons. No damage would have been caused inboard by these rounds as the bolt-heads did not penetrate the mantlet.

Round No. 3 was a solid cast-iron spherical shot (American iron), of 451 lbs., fired from the Rodman XV-inch gun, with a charge of 50 lbs. of English powder. This shot grazed short of the shield, losing thereby about 40 feet of its striking velocity. The velocity on ricochet was 1,157 feet, and the shot struck with an "energy" of 89·5 foot tons per inch of shot's circumference, and with a force on impact of 4,186 foot tons. The shot rebounded 10 feet from the shield and was "set up" and a good deal fractured, but did not break up, as in the case of ordinary cast-iron. The shot struck near Round No. 2, on a bolt, indented and cracked the 5½-inch plate, broke away portions of H girders

Radial Deviation.	Effects. Depth.	Effects. Diameter	Striking Velocity.	Remarks.
Deflection 7′ R.	Through	..	1329	(at 6″ from hole) broken at head; two 2″ bolts broken; shield driven back 0·9″ below port. At the back, skin plate broken away for a space of 2′ 5″ × 1′ 2″, and edges of plate driven in (*see sketch*); 5″ plate broken right across, and edges forced in

MEASUREMENTS.

AB.... 20″
AC.... 6·5″
CD.... 3·5″
CF ... 10·5″
GH.... 7·5″
KI .... 5″
GO .... 29″
MN .... 17″
M to inner skin (bulged) 24″



The dotted lines show the original position of the plates.

Scale $\frac{1}{24}$th.

1′ 4″; portion of skin plate (1′ 3″ × 1′ 2″) driven 2′ to the rear, and piece of armour-plate, 9″ × 9″, 15′ to the rear. Head of shell, six large pieces and many small pieces in earth-mound, 27′ at rear; nut end of large bolt driven 36′ to the rear; piece of girder, 1′ 8″ × 4·5″, 18′ to the rear; half the rope mantlet blown 40′ to the rear; three large, two small bolts, and one rivet broken. This shell struck at a very weak part of the shield, viz., near the edges of the 5½″ and 5″ plates, and near the port-hole. The iron of the bolts appeared to be of very good quality, one of them broken by this round was found very much twisted, and bent in bolt-hole.

..	..	11″ × 11″	1342	Struck on a strong undamaged portion of shield, 1′ 9″ from left of upper plate and 1′ 6″ from top; head of shell remained in indent; 5½″ plate broken through from top of indent to top of shield, passing through entire thickness of plate at 2′ 3″ from left; the crack at top measured 1″ in width, and passed through 29 bolt-hole; crack 6″ long from left of indent towards edge of shield, and cracks are developed round 1470, one from bottom of hole to bottom of plate, and one on upper right of indent 4″ long; outside bolt in top row broken off at head, and plate cracked in bolt hole—from back side; 5″ plate cracked 2″ deep on its rear face at 2′ 3″ from left of shield. Top girder cracked on front flange for 6″ directly in rear of impact. Plates buckled at left edge, as follows:—Skin plate 1·5″, 5″ plate 2·5″, and 5½″ plate 2·75″; 5½″ plate overlaps 5″ plate 1·5″ to left of shield. At the back. skin-plate bulged and cracked for a length of 5″ close under lower top girder at 11″ from left of shield; girder cracked diagonally across web for a length of 1′ 3″, and bulged about 0·5″; crack commenced at a rivet hole. The bolt on left top corner driven back 2″, and rivets of upper angle-iron broken. The fracture of the armour-plates showed them to be well welded.

(cracked by previous firing), also two small bolts and eight rivets; eight rivets in strut were also broken and angle-iron of strut cracked. The broken portions of girders were driven some feet to the rear, passing *under* the mantlet.

Rounds Nos. 4 *and* 5 were Palliser shells of small capacity weighing 248 lbs., fired from a 9-inch rifled gun with the battering charge of 43 lbs. and a bursting charge of 2½ lbs. No. 4 round struck on a weak part of the shield, No. 5 on a strong part, and with the following results. No. 4 penetrated, bursting whilst passing through the shield; the damage was very great, a large piece of the front armour-plate (19 inches by 19 inches) broke off and was picked up 12 feet in rear, having passed through the port-hole; the 5-inch plate and skin plate were broken through, and a piece of the latter (15 inches by 14 inches) was picked up 2 feet at rear of shield; three large bolts, two small, and one rivet were broken; one nut of bolt was driven 56 feet to rear of shield, and portion of girder (20 inches by 5 inches) 18 feet to the rear; the head of shell and many pieces driven into earth mound 20 feet at rear; half of rope mantlet was blown away and proved useless for protection. Round No. 5 did comparatively very little damage, the shell burst on the face of 5½″ plate, which was broken by the impact, and the 5-inch plate and upper girder and skin were cracked; one 3-inch bolt was broken. These shells had a terminal velocity of about 1,335 feet and an "energy" of 110 foot tons per inch of shot's circumference. The "work" on impact amounted to 3,060 foot tons.

XVIII.
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THE Experiment was carried out in presence of the Ordnance

Number of Round.	Photographic Number.	Nature of Ordnance.	Projectile. Nature.	Weight in lbs.	Form and Diameter.	Length.	Bursting charge of Shell in lbs.	Charge in lbs.	Elevation.	Range in Yards.	Radial Deviation from Bull's Eye.
					"	"			'		"
1	1482	9" Rifled M.L. Wrought-Iron Gun of 12 tons	Palliser Shell	Empty 246	Head 1·5 Diameter 8·92	21	2·5	37 R.L.G.	20	70	10 R. 4 Low
2	1483	" "	Palliser Shot	248	"	18·5	..	43	15	"	9 L. 8 Low

No. 1 *Round* was a Palliser shell of "small capacity," weighing 248½ lbs., containing a bursting charge of 2½ lbs.' was fired from a 9-inch 12-ton rifled gun. It was fired for comparison with No. 1480, being aimed at the corre- ıding weak spot of the shield, but with a charge reduced to represent the striking velocity at 400 yards range. Owing adial deviation the shell did not strike the bull's eye; it penetrated to a depth of 12⅕ inches, broke two large bolts, cracked the skin-plate and one of the bottom girders. The velocity on impact of this shell was 1297 feet, with an ergy" of 103 foot-tons per inch of shot's circumference, and "work" amounting to 2,899 foot-tons.

1	1484	10" Rifled M.L. Wrought-Iron Gun of 18 tons	Palliser Shell	Empty 386	Head 1·5 Diameter 9·92	27·17	10	54	20	70	Striking angle 80°

The general damage to the shield resulting from the impact of the 396 lbs. Palliser shell fired from the 10-inch rifled of 18 tons, may thus be stated:—the shell struck below the port-hole, penetrated the two front plates, and burst. 5½-inch plate was much cracked, and a piece, 16 inches by 14 inches, was nearly detached; the 5-inch plate, in line mpact, was split from top to bottom, and opened out 3½ inches; the bottom girders were cracked, and two pieces (each

* Bore of gun wet.

Nos. XVIII and XIX.

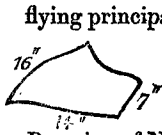
Shoeburyness, 16*th January*, 1868.

Select Committee and of the Special Committee on Iron Shields.

Deflection.	Effects. Depth of Indent.	Effects. Diameter.	Effects. Indent and Buckle.	Striking Velocity.	Remarks.
	″	″	″	/	
8′ Rt.	12·5	..	14·5	1297	Struck lower plate 2′ 9″ from left, 9″ from top, and burst, the pieces flying back. No. 41 bolt is sheared 5″ from front and shows in shell-hole. Bolt No. 39 sheared at 6·5″ from front, but remained in shield. Crack from top to bottom of plate through Nos. 1478 and 1479 indents. In No. 1478 there is a crack about 3″ broad right through shield. *In rear.*—The crack in skin-plate made by No. 1470 is opened out to 6·5″ in widest part, and extends from top to bottom of shield. A crack in skin 21″ below that by No. 1470, and up from the bolt on left (No. 44) of port-hole 6″ long. The top bottom girder is now pushed back at old fracture 19″, and cracked diagonally across on left 12″. A block of iron 1½ ton, which was touching the bottom girder, driven back 2′ 6″ by the shock. The 5″ plate cracked nearly through and bulged in line with the shot; opening of crack 1½″ wide on rear face. The crack extends horizontally along the plate apparently up to bolt No. 44. A 10″ Palliser shell, head 1·5 D., weight 398 lbs., fired with a charge of 54 lbs., penetrated 23 feet of earthen parapet, and passing out in an upward direction, fell 300 yards beyond.
5′ Rt.	13·86	..	15	1348	Struck upper plate 22″ from right, 20″ from top, partly overlapping No. 1477; the hole is now 15″ in diameter at widest part. Shot broke up, and part remained in hole; when removed the indent was found to be 13·86″. Piece of plate, about 2′ square and weighing about 7 cwt. 3 qrs. 7 lbs., broken off top corner, and thrown 9 yards to proper right. Bolts Nos. 24 and 30 broken off at distances of 6·5″ and 6″ from head respectively. 5″ plate 2½″ from skin at top corner. *In rear.*—The damage joins that of No. 1477. A piece of skin-plate about 14″ × 15″ torn off. The opening in 5″ plate is now about 7″ wide; a portion of the bottom inner flange of bottom top girder, 14″ long, broken off (4 rivets broken). The bottom top girder is also bulged and broken in web, and cracked in the web and inner flange in line with the edge of port. The plates are about 1″ away from the skin plate. The head of this shot and that of No. 1477 are about 6″ apart, and are both visible in the opening of the 5″ plate; portions of No. 1477 shot were driven to the rear of the shield at this round.

No. 2 *Round* (a Palliser solid shot of 248 lbs.), was fired from the same gun with the full battering charge of 43 lbs. It struck the shield close to No. 1477, partly overlapping that shot. The penetration was 13·8 inches, and a piece of the 5½-inch plate, weighing 7 cwt., was broken off and thrown 9 yards to the right. Two large bolts and four rivets were broken, also one of the top girders; a piece of skin-plate, 14 inches by 15 inches, was torn off, and portions of No. 1477 shot were driven to the rear of the shield. The shot had a terminal velocity of 1348 feet, an "energy" of 111 foot-tons per inch of shot's circumference, and the "work" on impact amounted to 3,124 foot-tons.

Shoeburyness, 22*nd January*, 1868.

Nil.	17	..	24 over 6 feet	1211*	Struck 19″ below centre of port, penetrated 5½″ and 5″ plates, and burst, fragments flying principally backwards. The shield is driven back about 1″; piece of 5½″ plate nearly broken off (only holding by about 2″ of front mould at right-bottom corner). Plate cracked through from No. 1469 indent to No. 47 bolt; from No. 43 bolt to nearest point of fracture caused by No. 1480, and from present shell-hole to 44 bolt. Remains of No. 1469 shot which were sticking in target thrown 5 yards to front. Head of No. 34 bolt broken off and thrown 5 yards to the front. This is the only large bolt broken by this round. The 5½″ plate is also cracked from top of indent to top of plate, and from rear to within 2″ of front, the crack being 1″ wide in rear.  *In rear.*—The 5″ plate, at 10″ from left edge of port, split from top to bottom, and opened out 3½″ at widest part. Behind shot-hole there is an H crack in the inner skin 12″ × 12″ and 2″ wide. All the bottom girders cracked through web and flange, and two pieces of centre girder (each 24″ long) carried one yard to rear. A piece of the bottom girder, about the same size, also broken off.† Crack in 5″ plate made by No. 1480 continued through plate. Small bolt between Nos. 34 and 38 is broken off in line with front of skin. No. 48 bolt bent to an angle of about 150°. † The girders on each side of the port were broken by previous rounds.

two feet long) were driven to the rear. One large and one small bolt were broken. The bursting charge was 10 lbs., which is proportionately larger than that of the "small capacity" 9-inch shells which were fired at the shield. The velocity on impact were 1211 feet, or about 30 feet lower than mean, owing to the bore of the gun being wet. The "energy" was 129 foot-tons per inch of circumference, and the stored up work amounted to 4,027 foot-tons.

APPENDIX No. XX.

Summary of Experiments against the Shield.

Summary of experiments against the shield.

GENERAL DAMAGE TO SHIELD BY PROJECTILES FIRED.

Gun.	Range.	Projectile.	General Damage.
9″ R.	Yards. 70	Palliser Solid Shot, 250 lbs. Battering Charge.	Penetration, 13″·8; broke off a piece of front plate, weighing 7 cwt. (but which fell at *front* of shield), and a piece of skin plate 15″ × 14″; girders damaged. N.B.—This round struck close to a hole made by a previous shot, driving portions of latter through skin plate.
,,	,,	Palliser Shell, 250 lbs. Battering Charge.	*Total penetration at weak part of shield*; 19″ × 19″ of front plate broken off and driven through port-hole; 5″ plate and skin plate broken through, and 15″ × 14″ of latter broken off. A similar shell at *strong part of shield* head of shell remaining in hole; cracked 5½″ plate through its thickness, and also cracked skin plate and girder.
,,	400	Palliser Solid Shot. Battering Charge.	Average penetration 10″·5; skin plate fractured where not backed by girders; girders broken.
,,	,,	Palliser Shell. Battering Charge.	Penetration, 12″·5; skin plate and girder cracked, and old cracks enlarged.
10″ R.	,,	Palliser Shell, 396 lbs. Battering Charge.	Penetration 17″; 5½″, and 5″ plate much broken; 2 ft. broken off two girders and driven to rear. N.B.—This shell struck at an angle of 80°, and its form was not as strong for penetration of iron as the 9″ shells.
XV-inch Rodman.	70	American Cast-Iron, 451 lbs. 50 lbs. E=60 lbs. A	Indent 3″·5, cracked and buckled front plate; broke girders, cracked and bulged skin, and separated plates considerably. N.B.—This shot grazed the ground before striking the shield.

DAMAGE TO FASTENINGS.

At Preliminary Trial by two Rounds.			Subsequent to insertion of Improved 3″ Bolts, by eight Rounds.		
3″ Bolts.	2″ Bolts.	Rivets.	3″ Bolts.	2″ Bolts.	Rivets,
16	7	7	7 (3 at Head)	8	28

The Shield was struck ten times.

	Yards.		Foot Tons.
9″ Palliser shot, with velocity due to	400	4	11,265
,, ,,	70	1	3,124
9″ Palliser shell ,,	400	1	2,899
,, ,,	70	2	6,158
10″ Palliser shell ,,	400	1	4,027
XV-in. American cast-iron shot, ditto	70	1	4,186
		10)	31,659
	Average blow		3,165

The inner skin was *penetrated* by projectiles twice;—in both cases the full battering charge having been used at 70 yards range:—

1st. By a shell striking on a weak portion of shield.

2nd. By a shot, striking close to one previously fired (the head of which had remained in the shield), and driving portions *of the latter* through the skin plate.

Fragments of iron (nuts, portions of skin plate, girders, &c.), were driven to the rear with violence in five instances (1477, 1479, 1480, 1483, 1484), but the rope mantlet would have prevented any damage arising from the nuts in the case of 1477.

A. HARRISON, *Capt. R.A.*,
Secretary, Special Committee on Iron Shields.

APPENDIX No. XXI.

ABSTRACT showing the Velocities of various projectiles determined by Captain W. H. Noble, R.A., under the direction of the Ordnance Select Committee.

Photographic No. of Round.	Target and Date.	Gun.	Charge.		Projectile.			Striking velocity at 70 yds.	$\frac{W v^2}{2g}$ in foot tons on impact.	Foot tons per inch of shot's circumference.
			Weight.	Brand of powder.	Nature and Length.	Weight.	Diameter.			
			lbs.			lbs.	inches.	feet		
1469	Gibraltar Shield 25 Oct., 1867.	9-inch rifled M.L. of 12 tons.	37	Rifle L.G.	Palliser shot, head 1 D, 18 ins.	248·0	8·92	1276	2799·9	99·92
1470	,,	,,	,,	,,	,,	,,	,,	1275	2795·5	99·76
1477	,, 19 Dec., 1867.	,,	,,	,,	,,	248·5	,,	1283	2836·5	101·22
1478	,,	,,	,,	,,	,,	251·0	,,	1276	2833·7	101·12
1480	,,	,,	43	,,	Palliser shell, head 1·5 D, 20 ins. Burster 2·375 lbs.	250·4	,,	1329	3066·8	109·44
1481	,,	,,	,,	,,	,, Burster 2·56 lbs.	247·6	,,	1342	3092·0	110·34
1479	,,	XV-inch Rodman, of 19 tons.	50	,,	Spherical American cast-iron.	451·0	14·89	1157*	4186·3	89·49
1482	,, 16 Jan., 1868	9-inch rifled M. L. of 12 tons	37	,,	Palliser shell, head 1·5 D, 21·0 ins. Burster 2·5 lbs.	248·5	8·92	1297	2899	103·4
1483	,,	,,	43	,,	Palliser shot, head 1·5 D. 18·9 in.	248·0	,,	1348	3125	111·5
1484	,, 22 Jan., 1868	10-inch rifled M. L. of 18 tons	54	,,	Palliser shell, head 1·5 D, 27·2 in. Burster 10 lbs.	396·0	9·92	1211†	4027	129·2

* Ricochet.

† Velocity about 30 feet lower than mean, owing to the bore of gun being wet from the heavy rain and the gun being loaded nearly half an hour before being fired, as a barge was in the line and the range not clear.

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TO THE

MINUTES OF EVIDENCE AND TO THE APPENDIX.

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ALDERSON, Captain HENRY JAMES, R.A. (*Analysis of Evidence.*)

The trial of the Gibraltar shield was unfavourable—291. Two 9-inch chilled shot was fired at 70 yards—293. Considered the iron badly disposed, and the shield too weak—294, 295. We do not yet know what thickness is necessary for a lasting defence—296. Thinks the bolts failed from the jar and nipping action or shearing of the plates—297; to which there will always be a tendency in using different thicknesses of plates—298. "Plank-upon-plank" system resists nearly as well as a solid plate. In building a target would have the front plate as thick as might be well made—299. Has seen 9-inch good large plates; also good smaller plates of greater thickness—300. Sees no difficulty in obtaining good 9-inch plates—301. Would prefer, in the Gibraltar shield, to make up the 12 inches by a 9-inch plate and 3 inches otherwise disposed—302. An elastic backing is required for the sake of the bolts—303; wood is as good as anything—304. The bolts gave way from rigidity of target, and from the nip and shearing—305. Shearing is the nip prolonged—306. A backing is indispensable—307, 308. An end-on backing, with wood between, would probably prevent shearing—309, 310. Thinks the Gibraltar shield dangerously weak at the sides of the port-hole—311, 312. Would have a plate of 8 or 9 inches in front, horizontal stringers filled in with wood, a skin-plate, and a backing—313–315. The plates were not set quite close together—316; but doubts if that affected the trial—317. Enlarging the holes, filling with wood, and rounding the edges, saves shearing—318, 319. It would be better, with two plates, not to have them in contact—320; would have wood between—321. Has not seen a rigid structure, wholly of iron, stand well—322.

BACKING.

1. *The general question of backing.*
2. *Cast-iron or chilled-iron.*
3. *Miscellaneous substances.*
4. *Stringers of iron.*
5. *Wood.*

1. *The general question of backing.*

On the whole thinks a soft backing a great advantage—*Baskcomb*, 997, 998.

Backing is essential—*Chalmers*, 805, 806. By its elasticity, works off the shot's velocity and saves the second plate—*ib.* 781.

The harder the backing the better for the plate—*Ellis*, 693. Without backing the nuts flew off in a shower—*ib.* 698; backing is necessary—*ib.* 732

Should be of iron under all circumstances—*Lancaster*, 839, 840, 851, 857. All backing unnecessary, when bolts and washers are properly arranged—*ib.* 871.

Necessity for compressible backing—*Mallet*, 1191.

Plates separated by backing are in contact on the horizontal stringers—*Palliser*, 539.

Thick plates are better without backing between—*Wilson*, 562. Rejects elastic backing—*ib.* 1321–1323.

BACKING—*cont.*

2. *Cast-iron or chilled-iron.*

Cast-iron used wholly would do away with the elasticity—*Chalmers*, 780; rigid backing brings the force of a blow on the rear fastenings—*ib.* 782. It might resist the penetration of the outer plate, but would not prevent its disintegration—*ib.* 783. If backing be entirely of iron, would leave an opening between the pieces to absorb some of the shot's work—*ib.* 819.

Cannot give an opinion as to chilled-iron—*Hughes*, 409–414.

Chilled-iron would be worth trying—*Noble*, 517–523. Cast-iron did not succeed—*ib.* 524–526.

Chilled-iron might be useful—*Wilmot*, 245; has not been tried—*ib.* 253, 254.

3. *Miscellaneous substances.*

Would fill the cells with a concrete of broken cast-iron and asphalte, or marine glue—*Chalmers*, 767, 779; which would exercise a brake action on the shot—*ib.* 768; causing it to stick—*ib.* 770. Would add 130*l.* to 150*l.* to the cost of the Gibraltar Shield—*ib.* 799, 800; wood backing might cost 30*l.* or 40*l.* less—*ib.* 801. Uses the glue for its elasticity—*ib.* 809.

Advantages of millboard at 30*s.* a ton—*Mallet*, 1214.

4. *Stringers of iron.*

Edge plates or stringers should not be more than 5 inches from centre to centre—*Chalmers*, 768, 820. Reasons for the usefulness of this backing—*ib.* 811–814; but objects to a backing entirely of stringers—*ib.* 817.

If wood be objected to, would use horizontal iron plates end-on and close together—*Hood*, 1061; which would be cheaper and more easily replaced than a solid plate—*ib.* 1064. The horizontal plates might be better if more than an inch thick—*ib.* 1065.

Horizontal stringers recommended with wood inside and between them—*Hughes*, 346–348, 350, 358. Depth to equal thickness of front plate—*ib.* 349, 355, 357. Vertical stringers farther back—*ib.* 351–354. Stringers should be hollow—*ib.* 358–363. If the wood packing perished, its renewal would be difficult—*ib.* 364. Has proposed to pack with Trinidad pitch—*ib.* 365, 366. For a fourth-class shield the width of stringer at top would be 4 inches—*ib.* 367. Size of pieces in wood packing—*ib.* 369–372. In his experimental shield half the backing is filled with teak, half with bitumen—*ib.* 373. Stringers are farther apart in a strong than a weaker shield—*ib.* 384–387.

Stringers approved—*Lancaster*, 839, 840, 852, 853. Sees no advantage in their being solid—*ib.* 877–879.

Chalmers' backing very costly, but offers enormous resistance—*Lefroy*, 197.

That known as Campbell's or Chalmer's should be incorporated in any system of iron defence—*Noble*, 489.

All iron ships in the navy are built with iron stringers—*Robinson* 279; they afford a valuable stiffening and support—*ib.* 280; but would not save the skin unless there were wood between it and the outer plate—*ib.* 281.

Objects to end-on stringers—*Wilson*, 1321–1323.

BACKING—*cont.*

5. *Wood.*

Elastic backing required for the sake of the bolts—*Alderson*, 303, 307, 308. Wood is as good as anything—*ib.* 304. End-on backing with wood between would probably prevent shearing—*ib.* 309, 310.

Was always in favour of wood—*Baskcomb*, 951. 9 inches of backing equal to 1 inch of iron plate—*ib.* 953. The best wood is teak—*ib.* 965. In ships, armour-plates are fitted to it with waterproof glue—*ib.* 976. Backing disperses the effect of a blow—*ib.* 979; its elasticity saving the bolts—*ib.* 988. All ships now built with armour-plates have wood backing—*ib.* 1009.

Prefers wood, except for its perishableness—*Chalmers*, 782, 786, 787, 792, 793. Special wood backing suggested—*ib.* 784; in which a 12-inch shot would penetrate the first and second plates, and bulge the inner skin—*ib.* 785. The supplemental backing might have iron ribs—*ib.* 789, 790. A wood backing could be easily replaced—*ib.* 807; and is unobjectionable—*ib.* 808.

Wood preferable to iron—*Clay*, 1105, 1106.

In a shield the wood is hermetically sealed from the weather—*Clerk*, 922. If the shield were struck and the wood got loose, it might be repaired and made watertight again—*ib.* 933. The wood should be protected from water resting on the top—*ib.* 934, 936, 937; by paint or otherwise—*ib.* 935. Wood would be safe from ants if sealed up in iron plates—*ib.* 940. Two pieces of wood cross-grained give great additional strength—*ib.* 947. Sealed hermetically, a wood backing could not burn, would only char; but a shell going in would blow the whole thing to pieces—*ib.* 948–950.

Deprecates teak—*Ellis*, 740.

Attaches the greatest value to wood—*Hood*, 1054. Would use stringers, as in the "Bellerophon"—*ib.* 1057–1060.

Wood is too perishable for open coast batteries—*Inglis*, 116; but a shield might have it, and it could be easily renewed—*ib.* 117. Could save the bolts without wood—*ib.* 118–122. A shield is preferable without wood—*ib.* 155, 156.

Does not believe in the great advantages ascribed to wood—*Lancaster*, 852, 853; and it is objectionable from perishable nature—*ib.* 854–856.

Wood forms an admirable cushion; only objection is its being perishable—*Lefroy*, 195. Might want renewal every ten years; no great difficulty in that—*ib.* 196.

Wood is of the utmost advantage to a shield and its fastenings—*Noble*, 477, 478.

Considers wooden backing very undesirable, but quite indispensable—*Robinson*, 270, 271, 282; nothing has yet equalled wood—*ib.* 275.

Sees no objection to wood for shields—*Wilmot*, 237.

BARS.

Defined—*Hughes*, 438.

Reasons for using—*Lancaster* 870. Has not experimented with those of full size—*ib.* 893.

BASHFORTH, Rev. F. (*Analysis of Evidence.*)

His experience limited to resistance of air and measuring velocities—1156. Felt the necessity of a chronograph to measure and record several observations on each shot—1157. Has completed experiments to find the air's resistance to heads of shot of diverse forms—1158. Found so little difference in the resistance to the various heads likely to be used that now they only experiment with varying diameters, whence will be able to deduce a law for calculating the velocity of any elongated projectile at any distance from the gun—1159, having given the initial velocity—1160. Has not experimented with spherical shot—1161. In stating law of penetration of iron-plates, there are three constants, *first*, form of shot's head; *second*, material of shot; *third*, uniform strength of plate—1162, 1163, and four variables; *first*, plate's thickness; *second*, shot's diameter; *third*, shot's weight; *fourth*, shot's velocity. Describes experiments he would pursue with these quantities to ascertain the law of penetration—1164, 1181, 1184. With a given penetration, there is a greater loss of *vis viva*, with high than with low velocities—1165; because there is greater lateral velocity imparted to the particles struck, and consequently a larger hole is made—1166, 1167. Proposes an experiment to test resistance of laminated, compared with solid plates—1168. Thinks the law of resistance only holds when the velocity is just sufficient for penetration. The rule does not hold in plates behind each other, because there is a loss of force in penetrating the first plate—1169–1173. Cannot state the relative resistance of plates supported fully, or only at the ends—1174. Should begin with small guns and thin plates—1175, and thence deduce a law for thicker plates—1176, 1180. Cannot say whether a back plate assists a front plate to resist a shot—1177, 1178. Does not consider that penetration of a shot varies inversely as the circumference—1179. The effect of obliquity in the shot is experimental entirely—1182; but will tell much in practice—1183.

BASHFORTH, Rev. F.—*cont.*

BASKCOMB, WILLIAM, Admiralty Overseer at the Thames Ironworks. (*Analysis of Evidence.*)

Always in favour of wood-backing—951. Reckons 9 inches of backing equal to 1 inch of plating—953. Would have preferred in the Gibraltar Shield to substitute 2 feet of wooden backing for a portion of the rear plates—954. Has not considered what strengthening that shield requires—956. Did not think the shield would stand—957, 958; had not depth or body enough—959; not enough iron; but its principle was bad for the fastenings—960; from the jarring—961; and because the structure was rigid—962. Is not aware of the relative proportion of targets to guns—963, 964. The best timber for backing is East India teak—965; for its durability—966. It takes the dry rot from oak, which has it in the vicinity—967; and it is subject to the white ant's ravages—968. Some teak would not last 10 years; other (as Malabar or Moulmein) 20 years and upwards. Instances certain ships—969. In green-heart the difficulty is to know sap from heart—970. The lasting of teak backing is a doubtful question. The "Warrior" was launched in 1860; no rot yet discovered—971–973. Oak hermetically sealed might last 40 or 50 years—974; or longer—975. Teak does not require preserving. Fits armour-plates to wood backing with waterproof glue—976. The more elastic a target is the better it stands—978. A backing disperses the effect of a blow—979. Is certain that 2 feet of backing added to Gibraltar Shield would keep out the 9-inch shot—980; would put it between the second plate and the 1½-inch plate—981, 982. With a 10-inch plate then substituted for the two 5-inch plates, the 600-pounder would still do great damage to the shield—984. Teak would decay more in a hot than in a moderately cold climate—985, 986. Doubts if it would last for 40 years at Malta or Gibraltar—987. Considers backing good, on account of its elasticity saving the bolts—988. The improvement of the bolts in the Gibraltar shield shows that in a rigid target bolts may be made to stand without a wooden backing—989–992. An Admiralty washer would assist the nut—993. The elastic principle is the best by which to get resistance to impact—994, 995. Bolts should not be screwed up severely—996. On the whole, thinks a soft backing a great advantage—997, 998. There is great difference of quality in teak—999–1003. Has seen most of the experiments—1004. Knows of nothing to alter the opinion formed by the Iron Plate Committee that wood backing could not well be dispensed with—1005–1008, 1010. All ships now built with armour-plates have wood backing—1009. Report of experiment on Gibraltar shield at Shoeburyness—*Appendix* vii.

BOLTS.

1. *General Questions of Bolts.*
2. *Heads.*
3. *Holes.*
4. *Metals for Bolts.*
5. *Nuts.*
6. *Palliser Bolts.*
7. *Russian Bolts.*
8. *Screw-Bolts.*
9. *Shanks.*
10. *Shearing.*
11. *Size.*

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1. *General Questions of Bolts.*

Should not be screwed up severely—*Baskcomb*, 996.

Has offered a bolt which would stretch much before breaking—*Chalmers*, 802; describes it—*ib.* 803. Would still hold, if thread stripped; less likely to snap than common or Palliser bolt—*ib.* 804. Would scarcely go more with an elastic concrete than a wood backing—*ib.* 810.

Uses in his shield plain Admiralty 3½-inch bolts—*Hughes*, 374; would have bolts from 4 to 3¾ inches thick, according to class of shield—*ib.* 378, bolting right through everything—*ib.* 379–383. Experiments, under impact—*ib. Appendix* ix.

Difficulty with fastenings, a mere question of bolt-power and good washers—*Lancaster*, 842. A 10-inch front plate requires a 4-inch bolt; greater thickness a proportionate

BOLTS—*cont.*

1. *General Question of Bolts—cont.*

increase—*ib.* 882. His plates would be bolted as well as clamped together—*ib.* 913; but bolts detract from a shield's strength—*ib.* 914. To be without nuts they must screw in very loosely—*ib.* 1348, 1349; doubts if they could be made with a square head to screw them by—*ib.* 1350.

Does not profess to understand bolts—*Lefroy*, 206.

Bolts have a tendency to snap where nipped by the plates shearing, would obviate it by reducing the shank—*Palliser*, 530, so that a portion of the bolt might stretch. Good iron will stretch 20 per cent.—*ib.* 531. Ill effects of shearing modified by rounding off the bolt-holes—*ib.* 540, 542. If plates were separated by a backing, their lateral motion would merely bend the bolts—*ib.* 541. Does not believe in fracture from jar; sometimes a bolt must stretch or break—544. As great a strain as any may be produced by the bulging of an inner skin—*ib.* 547.

Bolts should be few and large—*Wilmot*, 239; would rather get rid of them altogether—*ib.* 241.

A great source of weakness—*Wilson*, 563; should, if possible, be dispensed with—*ib.* 564, 565, 607. If used, shearing action ought to be prevented—*ib.* 566. Saw several at Shoebury broken at the shearing behind the front plate, where the nip is—*ib.* 622–626; probably because the iron they were made of was too hard—*ib.* 627–630, 655–659. At the second trial, the bolts were successful—*ib.* 631–633, 660, 661. Improvement attributable to better iron and to bevelling, wooden packing, and elastic washers—*ib.* 644, 666, 667. Experiments with—*ib.* 650. Manufacture described—*Wilson*, 608, 645, 646. With conical heads, bolts must be turned—*ib.* 647. Are indispensable for keeping the strut up to the back—*ib.* 1295.

Experiments with bolts under impact—*Appendix*, ix., x

2. *Heads.*

Never saw a bolt give way from its head being upset—*Hughes*, 375–377. Experiments proving this—*ib. Appendix* xi.

Attributes failure to heads being jumped on instead of bolt drawn down—*Palliser*, 528, 535, 545, 546.

Cannot discover that upsetting has disturbed the fibre—*Wilson*, 609; or that breaking was attributable to it—*ib.* 627–630.

3. *Holes.*

Enlarging, filling in with wood, and rounding the edges, saves shearing—*Alderson*, 318, 319.

Fitted tightly are liable to shearing; but if holes are tapered inside, bolts suffer less—*Ellis*, 692. Bolt-holes are a source of weakness—*ib.* 727.

Would make them large, rounded off, and packed with wood—*Inglis*, 110, 139; the bolts should have play—*ib.* 118–122. Holes with edges rounded are now adopted extensively—*ib.* 160.

Holes should be countersunk to diminish shearing—*Wilson*, 574–577.

4. *Metals for bolts.*

Steel bolts break short off—*Ellis*, 724; and are inferior to iron—*ib.* 725. Acadian iron would make good bolts—*ib.* 723. The bolts tried at Shoeburyness were of very inferior iron—*ib.* 757–759.

Staffordshire crown iron unsuitable—*Inglis*, 107, 108, 110, 114, 139.

5. *Nuts.*

Would do away with them altogether—*Ellis*, 694–696, 721, 722.

In all the experiments on board the "Thunderer," has only seen one nut broken—*Hood*, 1047.

6. *Palliser bolts.*

Would make use of for shields—*Noble*, 489.

7. *Russian bolts.*

Hollow, allowing of rapid renewals—*Hughes*, 389, 390.

8. *Screw bolts.*

Makes wood screws for the French, but has never seen experiments on them—*Ellis*, 714–716; bolts screwed into an iron backing stand better than with nuts—*ib.* 717–719. Compares these screws with those in a locomotive boiler; should be quite loose at junction of plates—*ib.* 720; would screw into back—*ib.* 721, 722. To renew a tapped bolt it must be drilled out—*ib.* 748. A nut or another screw bolt would then have to be inserted—*ib.* 794.

9. *Shank.*

More turned down in certain successful bolts—*Wilson*, 660, 661.

10. *Shearing.*

Always a tendency to shearing in using different

BOLTS—*cont.*

10. *Shearing—cont.*

thicknesses of plates—*Alderson*, 298. Is the nipping of the plates prolonged—*ib.* 306. End-on backing, with wood between, would probably prevent it—*ib.* 309, 310.

Shearing forms a new element for investigation—*Jervois*, 27.

11. *Size.*

No gain in enlarging the bolt beyond 3 inches—*Ellis*, 726–728. The strength required for the bolt does not depend upon the thickness of the plate—*ib.* 729; 3-inch bolts were quite strong enough for two 5-inch plates—*ib.* 730, 731.

BURGOYNE, General Sir JOHN FOX, Bart., G.C.B., Director of Works. (*Analysis of Evidence.*)

Points out why land defences do not require such power as the armour-plating of ships—1. Considers the statements about the inefficiency of the Gibraltar shield to be exaggerated; but would have two classes of shields, one for very exposed situations, and the present shield, with more iron and improved bolts, for inferior places. For dangerous cases the Russians have 2 feet of iron—2, 16. Thinks it desirable to find the least expensive shield for guns on shore—4, 17. Perfect immunity is of less consequence on extended fronts, if you have spare guns—5, 20. The damage done to the Gibraltar shield would not have rendered the gun unserviceable—6. Would rather have this for its purpose than a stronger one costing much more money; but the bolts want improvement—7. A second shot on the same spot would do much mischief, but the chances are much against such a hit—8. Thinks that rolled plates at 16*l.* a ton would do for land defence—9, 10. Does not think the question of using on shore thick plates of cheaper iron has been sufficiently considered—11, 12, 14, 15. Does not suppose the Gibraltar shield was of inferior iron—13. Thinks it would stand four or five scattered shot—20. Malta and Gibraltar are favourable places for the less powerful class of shields—21; and for inferior positions this shield is quite strong enough; for exposed parts it can easily be strengthened—22.

CASEMATES.

Every open battery should have rudimentary casemates of stone, if earth be unsuitable—*Mallet*, 1195–1197.

CHALMERS' TARGET.

Was tested in 1865—*Chalmers*, 765. Edge-plates were wider apart than he advised—*ib.* 794. Is willing to produce design for a shield—*ib.* 798. Would have his front plate thicker than before—*ib.* 816.

Was very complicated, 21½ inches thick in all, of which 15 were iron—*Lefroy*, 198.

The system of iron stringers affords a valuable stiffening and support—*Robinson*, 280; but wood is required between the skin and outer plates—*ib.* 281.

CHALMERS, JAMES.

Has made one shield—764; which was tested in 1865—765. The greater thickness the shield has the longer time does it obtain to resist the shot's penetration, and the greater area at the back does the shot operate on—766. *Time* being an element, would divide the resisting parts into two portions, connect them by ribs of iron or steel (would prefer soft steel), and fill up the cells in the backing with broken cast-iron and asphalte, or marine glue—757, 779. Has not tried this backing, but believes it would exercise a brake-action on the shot, causing it to jam; cites an instance at Vincennes; the edge-plates should not be more than 5 inches from centre to centre—768. The shot at Vincennes were 9-inch, with ogival heads of one diameter—769; the plate 5½ inches; thinks the material of a shot would stick in proposed backing, and prevent penetration of a second shot—770. Such a structure would much confine a shell; the elasticity of the backing would relieve the fastenings, which keep the shield in position, of much work—771. An 11-inch plate was destroyed by a single 13½-inch shot, representing 5,900 foot-tons of work—772. The plate was unbacked; the range 200 yards—773. It proved that destruction does not come merely from penetration—774, 775. The 13½-inch plate, 8 feet by 6 feet, was broken clear through by a 9·22-inch steel shot, with a 30-lb. charge. Another disadvantage in thick plates is the difficulty in fastening them. Smallness in the port-hole is equally in favour of a built-up shield. A 7-inch Palliser shot goes right through a 7-inch unbacked plate at 200 yards. Plates will not improve in quality with their thickness. It will require a solid 13-inch plate to resist a 12-inch gun, as regards penetration merely—776; but cracking the plates is equally harmful. A 12-inch

CHALMERS, JAMES—*cont.*
rifled gun, or 15-inch Rodman, would overcome 15-inch plates in four shots within a radius of 4 feet from centre of port-hole—777, 778. To use cast-iron wholly for backing would be to lose the elasticity—780; which would work off the shot's velocity, and save the second plate—781; but would prefer a wood and iron backing, except for the objection to its perishableness—782, 786, 787, 792. A cast-iron rigid backing would bring the force of a blow on the rear fastenings—782; though it might resist penetration of the outer plate, but not disintegration—783. Suggests a special wood-backing—784. A 12-inch shot would penetrate the first and second plates, and bulge the inner skin—785. Has no experience to justify his preference for steel—788. The supplemental backing might have iron ribs—789, 790. Too much rigidity is a fault in a backing—791. Wood is the best backing—793. In the target, on his plan, the edge plates were wider apart than he recommended—794. Colonel Younghusband and Captain Hore reported on the experiments at Vincennes—795. Two inches off the second plate, and added to the first, would make a better target—696; with the same materials—797. Will produce a plan of his own with estimate—798. The iron-and-asphalte backing would add 130*l.* to 150*l.* to the cost of the Gibraltar shield—799, 800. Wood-backing might be 30*l.* or 40*l.* less—801. Has offered a bolt which would stretch much before breaking—802. Describes it—803. It would still hold if the thread stripped; is less likely to snap than the common or Palliser bolt—804. A backing is essential—805, 806. A wood-backing could be easily replaced—807; and such a backing is unobjectionable—808. Proposes to use india-rubber glue or marine glue with his concrete backing, for the sake of elasticity—809. Does not think bolts would then go much more than with wood-backing—810. His backing of end-on stringers is useful as bringing the back plate to support the front plate at the moment of impact, but also as absorbing, with reference to time, the shot's velocity—811–814. Should be satisfied for his front plate with less thickness than calibre of attacking gun—815; but would have it thicker than before—816. Should object to a backing entirely of stringers—817. In the second trial of the Gibraltar shield the washers really took the place of backing—818. If the backing must be entirely of iron, would leave an opening between the pieces to absorb some of the work of the shot—819. His stringers are only 5 inches from centre to centre—820. Would rather absorb the shot's work than resist it by mere hardness and thickness—821. The outer plate should only be just strong enough to break in pieces the heaviest shot brought against it—822. Would rather have a 6-inch plate in front, and put the rest of the iron in the second plate—823. If everything were arranged, except the front plate, would rather have a thick one than a thin one—824. Submits a memorandum explaining his views in detail, and advancing that a built-up target, with a good backing, resists better than the same thickness of iron in a solid plate—824. Proposal for strengthening Gibraltar shield—*Appendix* i.

CHRONOGRAPH.
To measure and record several observations on each shot, Necessity for—*Bashforth*, 1157.

CLAMPS.
Preferable to bolts—*Lancaster*, 917.
Might hold front plates together—*Wilson*, 1287, 1294.

CLAY, WILLIAM, Mersey Iron and Steel Works. (*Analysis of Evidence.*)
Can now make plates 17 feet by 4 feet, and 10 inches thick—1086. Could easily make them 7 feet wide—1087; and equally well welded—1088. Difficulty in procuring uniformity depends more on the thickness than the width—1089. With suitable machinery, sees no limit to practicable thickness—1090. 5-inch or 6-inch plates cost 29*l.* or 30*l.* a-ton; and price increases roughly by 1*l.* per inch thickness, and 1*l.* per foot in width, beyond 4 feet—1092. Has no experience as to bolts—1093. Has seen many plates fired at—1094; including 8-inch plates, with Mackay's 8-inch gun—1095, 1096; carrying a bolt of 150 lbs.—1097; with a slightly rounded head—1098; and having a striking velocity of 2,100 feet—1099; at a 70-feet range—1100. The plate was unbacked—1101; and being only 4 feet by 3 feet was not pierced—1102. The same gun pierced a plate like the "Agincourt" target—1103. Has no knowledge of the Gibraltar shield—1104. Thinks wood a better backing than iron—1105, 1106. The proportionate increase of strength in thicker plates depends upon the fibre being rolled down to the same toughness as in thinner plates—1107–1109. Such rolling down is a mere question of machinery—1109, 1121. Has not noticed much buckling in 5-inch to 7-inch plates—1110–1112; but thick plates, being stiffer, buckle less than thinner plates—1113, 1114. Does not think they crack more—1115–1118; or are more distorted at the back—1119. At present, thick plates are inferior in quality to the thinner plates—1120. Shows what different results are to be expected from the experiments at Portsmouth and Shoeburyness respectively—1122. Considers the hardness of certain plates due rather to chemical than manufacturing reasons; has some doubt whether, in our desire for perfect welding, we do not sacrifice some of the iron's tenacity, which hammering and rolling in combination might retain—1123. A brittle plate, re-rolled from 8 inches to 5 inches, was much improved in toughness and tenacity—1124. That plate could easily be tested—1125. Attributes the hardness of hammered plates to their being made of scrap-iron, a treacherous material—1126. Hammered plates should be afterwards rolled—1127; to soften and reduce their crystalline nature to fibre—1128. Toughness is determinable mainly by experience—1129; not by mechanical tests—1130–1132. Does not think a file would show the relative hardness, which seems to depend on the manipulation. Fibrous plates become crystallised in course of manufacture—1133. The fracture of the iron shows its hardness—1134, 1135. At Portsmouth, with a 68-lb. shot, 13 lbs. charge, at 20 feet, was held equivalent to 16 lbs. at 200 yards—1136. Plates that would have been condemned, as against 68-lbs. shot at low velocity, were satisfactory as against hard projectiles at high velocity—1137; though the indentation by the latter was greater—1138. Describes the trial with the 68-lb. shot—1139; the Palliser shot would act similarly—1140, 1141; one breaking, the other punching the plate. Could undertake to make one hammered plate for a shield 12 feet by 8 feet, and 18 inches thick—1142, 1143, 1145–1147; less costly than a rolled plate—1143; say, for a quantity, 30*l.* to 35*l.* a-ton—1148, 1149. Its quality would be good—1150. Hammering gives more solidity than rolling—1151; hardness doubtful—1152. With his existing machinery, could only make the shield in two plates—1153. The same iron works equally well under roller or hammer—1154. Some irons stand much more fire than others—1155.

COST.
An English gun ought to be stopped for less than 2,000*l.* per gun—*Hughes*, 454, 455.

CLERK, Colonel H., R.A., F.R.S. (*Analysis of Evidence.*)
Teak is so durable in itself, as not to require any preservative—921. In a Gibraltar shield it would be hermetically sealed from the weather—922; being oily it preserves the iron in contact with it—923. Where not covered with iron, it should be painted—924. In the case of oak, would char the surface—925; and the bolt-holes: oak does not agree with iron—926. Teak backing would be good for 30 or 40 years; charred oak lasts long—927. Teak carefully pitched and hermetically sealed might last 100 or 200 years, or for ever—928, 932; is the most durable wood he knows—928. Never knew rotten teak, unless from a defective tree—929. Its only objection is its splintering—930. Never knew dry rot in it—931. Never shrinks—932. If the shield were struck, and the wood got loose, it might be repaired and made watertight again—933. The wood should be protected from water resting on the top—934, 936, 937. The upper surface would be protected by paint—935. Teak is not proof against the white ant; only woods containing certain aromatic oils are—938, 939, as cedar. The ant would be excluded if the backing were sealed up in iron plates—940. Knows little of green-heart, it is strong but brittle. Teak splinters and the splinters are poisonous—941. Has injected sulphate of copper to preserve wood, but the wood must be very young; it will get through poplar—942; or fir—943. Inapplicable to hard woods. For English woods charring is efficient—944. Teak would outlast oak—945. It is not the hardest wood, but the most durable—946. Two pieces of wood cross-grained give great additional strength; a solid block of teak is the best timber—947. A wood backing sealed hermetically could not burn, would only char; but a shell going in would blow the whole thing to pieces—948–950.

EARTH.
Legitimate material for batteries—*Mallet*, 1196, 1197.

ELLIS, JOHN D. (*Analysis of Evidence.*)

Is engaged at the Atlas Works of Brown and Co.—671. Was present at the trial of 19th December—672. Considers the Gibraltar shield to be badly constructed mechanically, and too light in material for the shot fired at it—674; faulty in being laminated, in the middle plate being in three pieces, and weak at the port-hole—675. Girder supports were of the worst form—676; and sure to break—677. A 10-inch plate and a 5-inch plate would resist well two Palliser 9-inch shots close together—678–680. Cannot give the thickness of plate to resist a given gun—682. Would not have a face-plate thinner than 10 inches—683. No difficulty in making a 10-inch plate up to 30 feet by 4½ feet—684. There is difficulty in heating a greater width—685, 703; explains the reason—686–688, 705. Two 5-inch plates would equal in resistance a 7½-inch plate—689, 690; leaving aside the question of bolts—691. Bolts fitted tightly are liable to shearing action, but if the holes are tapered inside they suffer less—692. The harder the backing, the better for the plate—693. Would do away with nuts altogether—694–696. Without backing, the nuts flew off in a shower—698. A large 10-inch plate is about to be tried at Portsmouth—699–701. Has rolled a 13½-inch plate 6 feet 6 inches wide—702. Has made many 10-inch plates perfectly solid; made one 15-inch plate; believes that is truly solid—704. Defines a "mould"—706. Can roll 15-inch plates perfectly sound, 4 feet wide, and of any length—707–710. Lately submitted a plan for Plymouth Fort, and tendered for these shields—711–713. Makes wood screws for the French, but has never seen experiments on them—714–716. Bolts screwed into an iron backing stand better than with nuts—717–719. Compares these screws with the screws in a locomotive boiler; they should be quite loose at the junction of the plates—720. Would do away with nuts, and screw the whole into the back—721, 722. Acadian iron would make good bolts—723. Steel bolts break short off—724; are inferior to iron—725. No gain in enlarging the bolt beyond 3 inches—726, 728. Bolt-holes are a source of weakness—727. Does not think the strength required for the bolt depends upon the thickness of the plate—729. Bolts of 3 inches were quite strong enough for two 5-inch plates—730, 731. Against modern powerful guns, would require backing and two plates—732; as thick in front as practicable—733. The two series of plates should cross; trustworthy plates cannot be forged wide enough to form the shield in one piece—734–739. Deprecates a teak backing—740. Could easily cover the shield with two plates—741, 742. The strength needed depends on the position of the shield—743. Softest and toughest iron is best for plates—744. Can now weld plates better than when the Iron Plate Committee reported—745, 746. Can ensure good welding up to 10 inches—747. To renew a tapped bolt, it must be drilled out—748. A nut or another screw-bolt would then have to be inserted—749. The thin skin behind the Gibraltar shield might be dispensed with—750, 751. The supports might be of solid iron, and the screws screwed right into them—752. Could not make sound 13-inch plates 8 feet wide—753; but could manage a 6-inch plate of that width—754–756. The bolts tried at Shoeburyness were of very inferior iron—757–759. Deposits two drawings of forts—760. A 7-inch plate costs 30*l.*, a 10-inch 36*l.*, and a 15-inch 42*l.* 10*s.* per ton; a 5-inch from 28*l.* to 29*l.*—761, 762.

EMBRASURES.

Corrugated cheeks to keep out shot—*Hughes*, 466.

EXPERIMENTS.

1. *Generally.*
2. *Liverpool.*
3. *Portsmouth.*
4. *Shoeburyness.*

1. *Generally.*

Different results to be expected at Portsmouth and Shoeburyness—*Clay*, 1122.

Insufficiency of those made against land defences—*Noble*, 480, 481, 482, 484, 504–506. Reasons for making trials at short ranges with reduced charges—*ib.* 492, 493.

Experiments with bolts under impact—*Appendix* ix, x, xi.

2. *Liverpool.*

With Mackay's gun—*Clay*, 1094–1103.

EXPERIMENTS—*cont.*

3. *Portsmouth.*

For a 68-lb. shot a 13-lb. charge at 20 feet range considered equal to 16 lbs. at 200 yards—*Clay*, 1136. Experiments described—*ib.* 1139–1142.

Details experiments on board the "Thunderer" against various plates on wood backing—*Hood*, 1013–1032, 1036, 1037–1039, 1058, 1070–1074—*Appendix* xiv. Many of the plates which have been shot at are at Portsmouth—*ib.* 1081.

4. *Shoeburyness.*

Trial of Gibraltar shield, 25th October, 1867—*Ordnance Select Committee, Appendix* iv, v.

Trial of Gibraltar shield before this Committee—*Appendix* xvii, xviii, xix.

Test experiments on plates for Gibraltar shields—*Appendix* vi, viii.

Trial of Gibraltar shield, 19th December, 1867—*Baskcomb, Appendix* vii.

Trial of two iron shields in 1865—*Appendix* xvii.

FOREIGN SHIELDS.

Believes that a shield for a foreign Government was tried by Colonel Wilmot—*Lefroy*, 185.

GIBRALTAR.

A favourable place for the less powerful class of shields—*Burgoyne*, 21.

By torpedoes ships could be kept 400 yards off—*Jervois*, 53–56.

There are few places where a large ship could approach nearer than 800 yards—*Robinson*, 267, 276; but a turret-vessel might go much nearer—*ib.* 277, 278, 283.

GIBRALTAR SHIELD.

Trial was unfavourable—*Alderson*, 291; nature of trial—*ib.* 293. The iron was badly disposed, and the shield too weak—*ib.* 294, 295. Bolts failed from the jar and nipping, or shearing of the plates—*ib.* 297, and from the rigidity of the target—305. Would have a 9-inch plate, and 3 inches otherwise disposed—*ib.* 302. Thinks it dangerously weak at the sides of the port-hole—*ib.* 311, 312. Plates were not set close together—*ib.* 316; but doubts if that affected the trial—*ib.* 317.

Would substitute 2 feet of wood backing for some of the iron plate—*Baskcomb*, 954. Did not think it could stand—*ib.* 957, 958; had neither depth, body, nor iron enough—*ib.* 959; but its principle was bad for its fastenings—*ib.* 960, from the jarring—*ib.* 961, and because the structure was rigid—*ib.* 962. To keep out 9-inch shot would add 2 feet of wood backing—*ib.* 980, between the second plate and 1½-inch plate—*ib.* 981, 982. With a 10-inch plate then substituted for the two 5-inch plates, the 600-pounder would do great damage—*ib.* 984. Admiralty washers would assist the nuts—*ib.* 993. Report of Shoeburyness trial—*ib. Appendix* vii.

Its inefficiency exaggerated *Burgoyne*, 2; the damage done would not have rendered the gun unserviceable—*ib.* 6. Would rather have it for its purpose than a stronger one costing much more money; but the bolts want improvement—*ib.* 7. A second shot on same spot would do much mischief; but chances much against such a shot—*ib.* 8. Does not suppose the shield was of inferior iron—*ib.* 13. Thinks it would stand four or five scattered shot—*ib.* 20. Is quite strong enough for inferior positions; could easily be strengthened for exposed places—*ib.* 22

Two inches off the second plate, and added to the first, would make a better shield, with the same materials—*Chalmers*, 796, 797. In the second trial the washers really took the place of backing—*ib.* 818.

Proposal for strengthening—*ib.*, *Appendix* i.

Has no knowledge of—*Clay*, 1104.

Is badly constructed mechanically, and too light in material for the shot fired at it—*Ellis*, 674; faulty in being laminated, and in the middle plate being in three pieces, and weak at the port-hole—*ib.* 675. Girder supports were of the worst form—*ib.* 676, and sure to break—*ib.* 677. Skin at back might be dispensed with—*ib.* 750, 751. Bolts tried were of inferior iron—*ib.* 757–759.

Was present at last trial; but has made no report—*Hood*, 1012. Would be a much better protection with 6 inches of horizontal wood backing behind the 1½-inch plate, with an iron skin in its rear—*ib.* 1055.

Weight, 32 tons—*Hughes*, 327.

Reasons for principles and materials adopted; Messrs. Cammell and Co. contracted for it; approved the materials—*Inglis*, 80, 123–126. The iron was strong, elastic,

GIBRALTAR SHIELD—*cont.*

and ductile—*ib.* 83, 84. The armour-plate was A 1, and the bolts were tested—*ib.* 82; but the bolts were of two qualities—*ib.* 85, 86; and those of Staffordshire crown iron would not stand such percussive blows; they were nipped or sheared—*ib.* 110, 139. Their going was a serious weakness—*ib.* 107; never saw bolts go so before—*ib.* 108. Attributes the weakness to defective metal—*ib.* 114; but thinks an elastic body would have saved the fastenings—*ib.* 115, 118–122. These shields decided on—*ib.* 87; contract accepted—*ib.* 88; delivered—*ib.* 89, 91; sent out in batches—*ib.* 90, 95. Experimental firing decided on—*ib.* 92–94. Considers the principle of construction good, but would have more metal—*ib.* 96–99, 105, 142–145. In the trial, the two shots struck weak points—*ib.* 106; the struts stood well—*ib.* 110. There was not time for experiments before making the shields—*ib.* 111, 112. A limit was put to cost—*ib.* 113; 150*l.* extra would give 3 inches more iron—*ib.* 146, 147. A certain area has been rendered inefficient by a single shot—*ib.* 135; should be tried again with proper bolts—*ib.* 137. The trial was more severe than actual service—*ib.* 138. With slight additions, would answer till foreign ordnance can hit harder than ours—*ib.* 140; is as strong as the adjacent works—*ib.* 141. The shield tried at Shoebury fairly represented the Gibraltar target—*ib.* 152; but was less strongly supported—*ib.* 153, 154.

Trial was unfavourable to the bolts, but showed that on the whole the shield could resist the artillery likely to be brought against it; it is so made as to admit of strengthening at any time—*Jervois*, 24, 28; without other expense than the additional plates—*ib.* 29, 30. With a rope mantlet behind, it would amply protect the gunners—*ib.* 37, 38. The reasons for the quantities and principles in this shield—*ib.* 25, 26, 28. By its construction it gives most protection for its cost; could resist a 9-inch gun at 400 yards—*ib.* 27. Failure of the bolts variously attributed to screwing too tight, to "upset" heads, and to lateral pressure of pointed shot—*ib.* 28. Plans for strengthening it are under consideration—*ib.* 31–34. 250*l.* per shield would cover any strengthening. From the analogy of the bombardment of Fort Sumter, thinks the Shoebury trial represented a maximum of damage—*ib.* 35. The shields were intended for very important, but not the most important, positions at Malta and Gibraltar—*ib.* 36. They had to be provided in a given time for a given sum—*ib.* 39–41. Attributes the weakness shown principally to the bolts—*ib.* 42. More iron in all parts should resist better—*ib.* 43. To add iron is a mere question of expense—*ib.* 45. In the trial the shot struck the weakest part—*ib.* 46, 47. The bolts had ½-inch indiarubber washers—*ib.* 48. Does not think a second shot near the same spot would cause absolute destruction—*ib.* 49–52. Thirty-five have been made—*ib.* 63; by contract—*ib.* 61; by Cammell and Co.—*ib.* 64; who tendered lowest—*ib.* 65. The War Office superintends the construction—*ib.* 60. The plates are tested at Shoeburyness—*ib.* 62; promiscuously—*ib.* 66, 67, 69. Tests described—*ib.* 68, 70, 71. Three proposals for strengthening—*ib. Appendix* ii.

Wants more strengthening in centre parts, with a roof, floor, and sides, which would render it independent of the masonry—*Lancaster*, 830, 858, 911, 912. Would have had one solid front plate—*ib.* 835. Three-fourths the bolts in outside plate might be dispensed with by making the top and sole-plates hold it in position—*ib.* 845. Most of the bolts which went were sheared—*ib.* 872–875. Difficulty in strengthening much—*ib.* 894. Struts too weak—895–898, 901; though they supported the shield at the trial—899, 910. Has a tendency to turn over—*ib.* 901–904, 909. Was tied down at Shoebury, but could not be in a fortification—905–908. Many bolts might be done away with—*ib.* 918. Plan for strengthening—*ib.* 1335, 1336–1339, 1342, 1344, 1345–1347; at a cost of 850*l.* per shield—*ib.* 1340, 1341, 1351. A sole-plate is essential—*ib.* 1343, 1360. Does not think a 9-inch plate in front would answer as well as the system he proposes—*ib.* 1356–1358, 1361. It would not strengthen the weak girders—*ib.* 1359. A great portion of the through bolts might be done away with—*ib.* 1363. In a late trial, the girders suffered severely—*ib.* 1364–1366. Would rather have a whole plate than two halves—*ib.* 1367.

Trial on 25th October considered merely a preliminary test—*Lefroy*, 165. Does not think individual shots from a 9-inch gun at 400 yards would go through—*ib.* 166. The 1½-inch plate is not in the best place; would employ T girders instead of H girders—*ib.* 167, 180. Would give substantial security against a 15-inch gun with a 60 lbs. charge—*ib.* 168. Would rather have 20 guns with this shield than 10 guns with shields twice as strong and

GIBRALTAR SHIELD—*cont.*

costly—*ib.* 172. Would have more iron, if cost permitted; in action such a blow would not be struck as in the trial—*ib.* 172. More strength is desirable; it is a question of expense—*ib.* 174. Would spend another 10 per cent. in strengthening—*ib.* 176, 177. The salient point in the trial was the snapping of 13 bolts out of 28—*ib.* 178; which is attributable to bad manufacture—*ib.* 179. These shields afford sufficient protection to justify their erection—*ib.* 192. The faults lie in the thin plate not being between the other two and mainly in the bolts; how the latter went—*ib.* 193. Effect of a second shot on same spot would not be very disastrous—*ib.* 199; a view in section exaggerates the damage; the bolts did not fly dangerously to the rear—*ib.* 200. Eight shots from a 9-inch gun at 400 yards would render it useless for a defence—*ib.* 207, 208; but a vessel in motion would not do such firing in half a day—*ib.* 209.

Construction embraces almost every undesirable quality—*Mallet*, 1190, 1222.

Great defect was that the fastenings did not hold—*Noble*, 469. Not strong enough for the purpose intended—*ib.* 487. Has two very weak points beside the embrasure—*ib.* 496, 497; would reconstruct it and introduce a backing; to strengthen present structure would have an extra 5-inch plate on the outside, or an 8-inch in place of the present 5½-inch—*ib.* 488, 498, 499. It might have been better to have put the thin plate in the middle—*ib.* 507, 508. Does not fairly represent the plank-upon-plank system—*ib.* 527.

Report of trial, 25th October, 1867—*Ordnance Select Committee, Appendix* iv., v.

Bolts were not screwed up too tightly—*Palliser*, 529.

Account of practice against, on 25th October—*Wilmot*, 212–217, 240. Did not stand well; 16 bolts were driven off—*ib.* 220; but expected a still greater effect—*ib.* 227–231. The absolute effect was from bolts giving way and faulty construction—*ib.* 221, 234. Plates seemed well made—*ib.* 222; but did not bed close together—*ib.* 246; from a slight curvature—*ib.* 247. The gun was not heavier than would be used against fortifications—*ib.* 229, 230. Bolts were conical-headed—*ib.* 225; and countersunk, but fitted too lightly in cylindrical holes—*ib.* 226, 235; the motion of the plates nipped and almost sheared them *ib.* 244; might have stood better with an elastic backing—*ib.* 236. Might have been stronger for the mass of iron in it—*ib.* 219; but the mass was hardly sufficient for the object—*ib.* 233.

The plates were reduced to their actual thickness to bring the cost down to a given sum. On the system adopted extra armour could at any time be added—*Wilson*, 550. The thickness originally designed was 15 inches—*ib.* 551. Made bolts and armour—*ib.* 553. Considers the bridge sections in the original design a source of danger—*ib.* 560, 561. To strengthen would add 6 inches of iron between the skin-plate and the intermediate plates—*ib.* 597–602; as cheaper than putting a thicker plate in front—*ib.* 604. As to alleged curvature of plates—*ib.* 613–616. Proposed methods of strengthening—*ib.* 1324–1327—*Appendix* iii.

Trial before this Committee—*Appendix* xvii., xviii., xix.

Summary of Experiments—*Appendix* xx.

GLUE, HAY'S WATERPROOF.

Used in fixing armour-plates to wood backing—*Baskcomb*, 976.

GRANITE.

Unsuitable for batteries—*Mallet*, 1191. Rubble granite may resist better than large blocks—*ib.* 1220.

GREEN-HEART. *See* WOODS.

GUNS.

Does not think heavier guns than the 9-inch will be used in a broadside—*Hood*, 1066, 1067; or 12-inch guns in a turret—*ib.* 1068, 1069.

Not aware if there be a foreign gun more powerful than the 9-inch English gun—*Hughes*, 456.

The 9-inch rifled 12-ton gun is more powerful than the 15-inch Rodman—*Jervois*, 27, 72, 73.

Must provide against 15-inch, and perhaps larger guns—*Lancaster*, 847.

Does not believe in 100-lb. charges of 15-inch guns for ordinary service—*Lefroy*, 168. A 9-inch gun, with carriage and platform, now costs 1,200*l.*—*ib.* 175. Our 9-inch gun, with a 60-lb. charge, is a more powerful piercer than an American 15-inch gun, with 100 lbs.

charge—*ib.* 186. Thinks a calibre of 10 or 11 inches will be the largest for naval service—*ib.* 187, 188.

Increase of, since the trial against the Inglis shield—*Noble*, 480, 481, 484, 504–506. Relative power of 9-inch and 10-inch rifled guns,—*ib. Appendix* xv.

We may go to 24 tons; but cannot consider any at present trustworthy beyond 12½—*Robinson*, 266.

HERCULES TARGET.

When penetrated by a 23-ton gun, the wood backing saved the structure—*Robinson*, 275.

HOOD, Captain ARTHUR W. A., R.N., Commanding Her Majesty's ship "Excellent." (*Analysis of Evidence.*)

Was present at the last trial of the Gibraltar shield; has made no report—1012. The only rifled gun he has tried against iron plates is the 7-inch, with Palliser projectile—1013, 1014; and the thickest plate, Brown's 8-inch A 1—1015; at 30-feet range—1016; with reduced charges—1017. The projectile was the 115-lb. solid Palliser shot; three shot had heads of 1 diam. radius, three of 1½ diam.—1018, 1019. The plate was on 40 inches of good teak or oak, without stringers, bolted right through with ordinary 2¾-inch bolts, each with one nut and an iron washer only—1020–1022, 1025, 1058. Area of plate, 14 by 4½ feet—1023. Cannot state the distance of bolt-holes apart—1024. Describes the practice, and its effect on the backing—1026. The sharper-pointed shot did the more damage—1027, 1028. No portion of the plate was detached and forced into the backing—1029, 1030. The plate had been previously marked A 1—1031. The bolts stood very well—1032. The usual test is nine 68-lb. spherical shot, with 13-lb. charges, and 30-feet range, striking within 3 square feet—1033–1035. With 22-lb. charge, the 8½-ton gun went through a good 6-inch plate and 40 inches of backing, breaking up against a 4½-inch plate 20 feet in the rear—1036, 1037, 1039. It struck the rear-plate with the point—1038. The experiments show the law that, with a good plate, the thickness of the gun's calibre will just resist the gun's shot—1040–1043. Has only seen one nut broken in all his experiments on board the "Thunderer"—1047; though they had but the iron washer—1048. In naval action, the striking of a shield 12 feet by 8 feet, at 200 yards, with any frequency, would be quite a chance—1049, 1050. In case of a ship passing by, not more than one shot in six or seven would hit—1051. Attaches the greatest value to wood backing—1054. The Gibraltar shield would be a much better protection with 6 inches of horizontal wood backing behind the 1½-inch plate, and an iron skin in rear of wood backing—1055. Shields should be in classes, according to the positions they would occupy. For a place where ships could come within 100 yards, would have a 9-inch plate in front, a 5-inch plate in rear of it, then 6 inches of wooden horizontal backing, and an iron skin. No shot would penetrate that—1056, 1063. The backing should have stringers, as in the "Bellerophon"—1057, The stringers allow of dispensing with some double backing—1059; and would employ them in land defences—1060. If wood be objected to, would have horizontal iron plates end-on and close together—1061; which would be cheaper and more easily replaced than a solid plate—1064. Does not think a shot could break up a 9-inch plate with a 5-inch in rear—1062. The horizontal plates might be better if more than an inch thick—1065. Does not think heavier guns than the 9-inch will be used in a broadside—1066, 1067; or 12-inch guns in a turret—1068, 1069. With his heaviest charge, in the experiment on the 8-inch plate, there were such large fissures at the back—1070, 1071; that a second shot near the same spot would go far to break up pieces of the plate—1072. The 6-inch plates buckled less than thinner plates, and cracked less than 8-inch plates—1073, 1074. Thick plates crack instead of buckling—1075, 1076. Is about to try the 10-inch plate—1077, 1083, 1084. The iron in the fracture appeared good—1078, 1080. Never saw Brown's or Cammell's plates peel off in layers; other plates have done so—1079. Many of the plates which have been shot at are at Portsmouth—1081. Describes a good fracture—1082. A turret ship would have less smoke to contend with in action than a broadside ship—1085.

HUGHES, JOHN, Manager, Millwall Iron Works. (*Analysis of Evidence.*)

The War Office is in possession of a shield for land defence constructed by him—323. Explains its nature—325, 326, 329. It weighs 28 tons—326; against the 32 tons of the Gibraltar shield—327; with equal area—328. Would divide shields into four classes, according to their exposed positions—330, 356. Prefers a solid plate to two plates making the same thickness—331. No difficulty in making plates of good quality up to 10 inches thick, at from 30*l.* per ton for 5-inch to 35*l.* for 10-inch plates—332–334. Could now roll a plate 7½ feet wide, at a slightly increased expense—335–337. Could undertake a plate 20 feet by 9½ feet at about 40*l.* per ton—338–343, 402. His principle for a shield is a thick plate in front—344, 345; with a backing of horizontal stringers—346, 350; having wood inside and between them, 347, 348, 358. The depth of the backing to equal the thickness of front plate—349, 355, 357. Next a thin plate, and then vertical stringers—351–354. Advantages of hollow stringers—358–363. If the wood in the stringers perished, its renewal would be difficult—364. Has proposed to fill them with Trinidad pitch—365; which, however, is very inflammable—366. For a fourth-class shield the width of stringer at top would be 4 inches—367. Teak in the backing would last at least 100 years—368. The wood in a 4-inch stringer would be 2½ by 5½ inches—369–372. In his experimental shield, half the backing is filled with teak, the other half with bitumen—373. The bolts are plain Admiralty 3½-inch bolts, with Baskcomb washers—374. Never saw a bolt give way from its head being "upset"—375–377. Would have bolts from 4 to 3¾ inches thick, according to class of shield—378; bolting right through everything—379–383. His stringers are farther apart in a strong than in a weaker shield—384; reasons for this arrangement—385–387. Believes a coating of plates could be hereafter added externally to a fort without interference with the structure—387, 388. For Russian forts, fastens with a hollow bolt, which allows renewals of plates to be rapidly made—389, 390. Can now roll plates 6 feet wide—391; but would extend the width to 9½ feet in six weeks—392–395. No more waste, in proportion to size, in rolling a large than a small plate—396–398. Planks 16½ inches wide would cost 18*l.* per ton—399, 400; plates of 4 feet wide 28*l.* to 30*l.* per ton—401. Chilled cast-iron is much more expensive than other iron; would cost about 10*l.* per ton, delivered—403–406. At Woolwich, only Pontypool iron is considered fit—407. Has not thought of chilled cast-iron for a backing—408; and cannot give an opinion on it—409–414. Has made shields for Russia, Turkey, and another foreign Government—415, 416. Was consulted as to the Antwerp fortifications—417. Considers the Russian shields stronger than the one he has for trial at Shoeburyness—418, 419; and double as costly—420, 423. Were expense no object, would prefer the Russian system—421, 422. Has made one Russian shield for three guns of great calibre—424. Describes the Russian and Antwerp shields—425, 426. The Russian shield has port-stiffeners. Is now making a very large shield for an exposed position at Cronstadt—427. Its thickness is equal to 27 inches of solid iron. The Russians put all the strength into the back of their shield—428. Would himself avoid lamination in every possible way—429. The Russian bars are on the tongue-and-groove principle. They bring everything, as we ought to do, but do not, up to the structure end-and-edge-on—430. The Russian shield is not yet made. They fire at very large models before commencing their works—431, 453. The horizontal bars are held together (besides their own dovetailing) by the back bars and dovetail bolts—432. The bars are 12 inches thick, and 2 feet wide; they are not plates—433, 434. It is prevented from being knocked over by vertical bars right along behind, and struts every 14½ feet—435–437. Explains what are bars—438. They are continuous in the Russian shield, with the fibre presented edge-on—439–441, 457; and dovetailed to others with perpendicular fibre—442; making 24 inches of iron—443; in front of which are two plates, each 1½ inch, making altogether 27 inches—444. Thinks it a good construction—445, 446; and a good application of iron—447; but would put a thicker plate in front—448. Does not think that a heavy shot would disrupt the whole shield—449. This Russian shield will cost more than 2,000*l.* per gun—450–452. You may stop an English gun for less than this cost—454, 455. Does not know if there be a foreign gun more powerful than the 9-inch English gun—456. A structure like the Russian fort may be made with plates firmly welded together, and corrugated also—459; and with parallel stringers—460. Such would not be very costly—461. In a granite fort, the Russians, instead of using shields, make the embrasures of iron, corrugating the cheek on both sides to keep out shot. All guns facing the sea, and open to attack by iron-clads, are to be thus protected—462; adapting iron to

HUGHES, JOHN—*cont.*

old fortifications—463. It is an expensive mode, and thinks a cheaper might be adopted—465. The Russians are making new forts, in advance of their old positions, miles out to sea—464. Thinks the corrugated check would prevent shot entering the embrasure; in 1860, at Shoeburyness, saw six dummies out of nine knocked down by a shot entering (without corrugation)—466.

Experiments with bolts under impact—*Appendix* xi.

INGLIS, Lieut.-Colonel THOMAS, R.E. (*Analysis of Evidence.*)

Details the progressive reasons for the principles and materials adopted in the Gibraltar shield; the contract was with Messrs. Cammell & Co., of Sheffield, and he approved materials supplied by that firm—80. The armour-plates were classed as A1; the bolts were tested [details the tests]—82. The iron was strong, elastic, and ductile—83, 84. There were two qualities of iron in the bolts; some were "S. Crown" iron—85, 86. It was decided to make these shields in October, 1866; first acceptance of contract, 26 November, 1866—87, 88. The shields were delivered from and after the close of March—89, 91; and were sent out in batches—90. It was decided in August to experiment on the shields by firing at them—92; would have preferred to do so earlier—93, 94. Thinks the first shipments were seven for Gibraltar, and seven for Malta—95. Considers the principle of construction, solid armour crossing armour, very good indeed; would have more metal, if used against a heavier gun than the 12-ton—96. To strengthen, would put another thickness of iron between the 5- and 5½-inch plates—97, 98; cannot say what thickness—99. A plank on the face of a shield should be 7 to 8 inches thick; but doubts if that applies to plates—100, 101; which, with solid backing, need not be as thick as planks—102, 103. The 5½-inch plates in the Gibraltar shield do not resist quite so well as his 7¼-inch planks—104; should like the metal a little thicker—105. In the trial, the two shots struck weak points—106; but the bolts giving way is a defect and weakness—107; never saw bolts go so before—108. Was surprised at it, but the Staffordshire iron will not stand such a percussive blow; the other bolts did much better; the strutts stood well; the penetration was as he expected; the bolts were nipped or sheared; proposes to remedy it by larger bolt-holes, rounded off and packed with wood—110, 139. Time did not allow of experiments before making these shields—111, 112. Thinks a limit was put to the cost—113. Attributes the weakness of the bolts to defective metal—114; but thinks an elastic body would have saved the fastenings—115. Timber has been considered too perishable for open coast batteries—116. A shield might, perhaps, have a wooden backing, which could be easily renewed—117. Could save the bolts by better material, elastic washers and more play, but without wood—118–122. Did not use "planks," because he doubted if manufacturers could turn them out fast enough—123–126. Does not think that any plate tried at Shoeburyness, thicker than 7 inches, has been thoroughly welded—127–130. Considers that planks can be made perfect up to 6½ inches—131. Does not think plates should be laminated instead of welded—133, 134. Special experimental plates ought not to be taken as specimens of general manufacture—132. For a certain area the shield has been rendered inefficient by a single shot—135. A shield should bear several shots within a small area—136. The Gibraltar shield should be tried again with proper bolts—137. It might have stood 20 shots at various angles, in actual service, as well as these two which were aimed exactly perpendicular to its surface—138. Considers that with slight additions the shield would answer till foreign guns could hit harder than ours—140; it is as strong as the adjacent works—141; but would like an inch or two more of iron in front—142–145. 150*l.* a shield would give about 3 inches of iron—146, 147. There should be some consistency between the strength of the shield and the adjacent works; if the latter crumbled away the men would not be safe—148, 149. Looks upon a shield as a substitute for masonry, where masonry could not be made strong enough—150. If the shield hold out, the gun may be effective though the masonry be crumbled to bits—151. The shield fired at at Shoebury represented accurately those sent to Gibraltar and Malta—152; but it had less support than it would have in its proper place—153, 154. A shield is preferable without wood—155, 156. The Gibraltar shield will soon be ready to be fired at again—157–159. Bolt-holes, with the edges rounded, are now adopted more extensively—160.

IRON.

Thinks rolled iron at 16*l.* a ton would do for land defences—*Burgoyne*, 9, 10. Doubts if the use of thicker iron of cheaper quality has been sufficiently considered for land defences—*ib.* 11, 12, 14, 15.

Scrap-iron a treacherous material—*Clay*, 1126. The same iron works equally well under roller or hammer—*ib.* 1154. Some irons stand more fire than others—*ib.* 1155.

Acadian makes good bolts—*Ellis*, 723; softest and toughest iron is best for plates—*ib.* 744.

Chilled cast-iron much more expensive than other iron; would cost 10*l.* per ton, delivered—*Hughes*, 403–406. Pontypool is the only iron considered fit for chilling at Woolwich—*ib.* 407.

Staffordshire Crown unsuited for bolts—*Inglis*, 107, 108, 110, 114, 139.

Wrought-iron of good quality is better than steel for front, middle, or back plate—*Lefroy*, 210.

Preferable to steel for plates—*Wilson*, 651, 652. Hardness or softness depends equally on the original pig-iron and on the course of manufacture—*ib.* 662–665.

IRON PLATE REPORT.

Fully concurs in views as to backing of wood—*Buskcomb*, 1005–1008, 1010.

JERVOIS, Colonel W. F. D., C.B., R.E., Deputy Director of Works. (*Analysis of Evidence.*)

Considers the trial of Gibraltar shields unfavourable to the bolts; but as showing that, on the whole, the shield could resist the artillery likely to be brought against it; it is so made as to admit of strengthening at any time—24. Details and explains the experience and reasons which led to the adoption of the quantities and principles in it—25, 26. Doubts the uniform rule of resistance holding good beyond 5½ inches; beyond which, however, plates increase rapidly in cost—26. By its construction, the Gibraltar shield gives most for the money. The 9-inch rifled 12-ton gun is more powerful than the 15-inch Rodman, and the shield could resist that at 400 yards. A battery's great function is to protect the torpedoes; shearing action upon bolts formed a new element to deal with—27, 72, 73. Colonel Inglis attributes it to the bolts being screwed too tight; Major Palliser to their heads being upset; believes the lateral pressure of hard pointed shot will account for it. Only 30,000*l.* being available, it was considered desirable to shelter as many guns as possible; wherefore 1,000*l.* a shield was fixed as the cost. The strength can always be increased—28, without other expense than the additional plates—29, 30. Has plans under consideration for strengthening these shields; but none has yet been adopted—31–34. Thinks 250*l.* per shield would cover any strengthening. Describes the attack by monitors on Fort Sumter; whence he infers that not one shot would have struck a single shield, or, not to push the analogy too far, that its trial would not be more severe than at Shoebury—35. The shields were intended for very important, but not the most important positions at Malta and Gibraltar—36. With a rope mantlet behind, the shield would amply protect the gunners—37, 38. The shields had to be provided in a given time for a given sum—39–41. Attributes the weakness shown principally to the bolts—42. With more iron all parts should resist better—43; to add iron is a mere question of money. A Russian shield has cost 3,000*l.* per gun—45. In the trial, the shot struck the weakest part; showing the necessity for avoiding unnecessary joints—46, 47. The bolts had ½-inch indiarubber washers—48. Does not think a second shot would cause absolute destruction to the plates—49–52. Thinks that by torpedoes ships might be kept at least 400 yards from Malta or Gibraltar works—53–56. Very few shot would hit the shields in a naval action—57–59. The War Office superintends the construction—60; which is by contract—61; the trials are at Shoeburyness—62. Thirty-five shields have been made—63; all by Cammell and Co.—64; who offered the lowest terms—65. The plates are tested at hazard from a batch of rolled plates—66, 67, 69. Describes the tests—68, 70. The test-plates for these shields are A 1—71. Plank and plate are not interchangeable terms—74. Considers a "plank" to be not above 18 inches wide, or thereabouts—75–78. Three proposals for strengthening Gibraltar shields—*ib. Appendix* ii.

JOINTS.

A less objection than bolt-holes—*Lancaster*, 850,

LANCASTER, CHARLES WILLIAM: (*Analysis of Evidence.*)

Was present at the second trial of the Gibraltar shield —825–827; has had great experience in iron fabrics—828, 829. Gibraltar shield wanted more strengthening in the centre parts; would have a roof, floor, and sides of iron, which add to the rigidity, and render the structure nearly independent of the masonry—830, 858, 912. An iron embrasure should be perfect *per se*—831, 862, and have no reference to the strength of the parapet—832–834. Would have had one solid plate instead of two—835. There ought to be 14 inches of iron—836, 837, unbacked—838; with a 12-inch plate, and none but iron-backing; approves of stringers—839, 840. Difficulty with fastenings is a mere matter of bolt-power and good washers; if you had a 10-inch plate a 3-inch bolt would be insufficient—842. Three-fourths of the number on the outside plate may be done away with—843, by making the top and sole plates hold it in its position; the structure becoming in itself an entirety—845. His system would involve much iron, and be costly, but would save nine-tenths of the bolts—846. We must provide against 15-inch, and perhaps larger guns—847. Such an embrasure as he proposes has been fired at satisfactorily in model—848, in the presence of Russian officers—849. Joints are a less objection than bolt-holes —850. In all views, prefers iron backing—851; does not believe in the great advantages attributed to wood. Iron stringers will bring up a shot equally well—852, 853. His objection to wood is its perishable nature—854–856. The security of his shield would be worth its extra cost—860, 861. His front plate should have support (not a backing)—girders, or struts—863, with Russian bars between—868, 869. Reasons for using bars—870. With bolts and washers properly arranged, all backing is unnecessary—871. In the Gibraltar shield, of the bolts which went many were sheared—872–875. In his shield there is an extra 6-inch plate round the port-hole, to compensate for the weakness it causes—876. Sees no superiority in stringers being solid—877–879. The top would overlap 3½ inches, and effectually hold in the front plate—880. The thickness consists of a 6-inch plate, over 12-inch Russian bars, with 6 inches extra round the port-hole—881. A 10-inch front plate wants a 4-inch bolt, and thicker plates proportionally larger bolts—882. The design he has described is a fort, scarcely suited for an embrasure—883. Will submit a plan—884. It would have 6-inch plates in front, about 5½ feet wide—885: with 12-inch grooved bars behind —886; dovetailed into vertical bars, every 4 feet—887; with the extra 6 inches round the port-hole—888. Would lock the shield from top and bottom by four bolts through top and sole plates—889, 890. Prefers anvil-like resistance to absorption of work by a yielding material—892. Has not experimented upon bars of full size—893. It would be difficult to strengthen the Gibraltar shield much—894. The struts are too weak—895–898, 901, though they supported the shields—899, 910. His design is altogether different — 900. The Gibraltar shield has a tendency to turn over—901–904, 909. The shield was tied down at Shoeburyness, but could not be in a fortification—905–908. It would be more complete with top, base, and sides—911. His plates would be bolted, as well as clamped together—913, but bolts detract from a shield's strength—914. Two loose plates would not be as strong as two rigidly connected; the desideratum is to obtain rigidity with fewest bolts—915, 916, 918. Prefers clamps to bolts —917. Many bolts might be done away with—918.

(*Second Examination.*)

Submits a plan for strengthening Gibraltar shield —1335, 1336, 1338, 1344; adding a minimum thickness of 10 inches of iron—1337. The structure is wholly of iron—1339; the additional cost, 850*l.* per shield—1340, 1341, 1351. The 6-inch plate in front will not diminish the space for training the gun. All the proposed new parts could be sent to foreign stations ready for fixing—1342. A sole-plate is essential—1343, 1360. Leaves the bolts and nuts exposed—1345. It would be easy to add a thin plate over the nuts—1346, 1347. Bolts to be without nuts would have to screw in very loosely—1348, which is an advantage as the shields are now constructed, because of shearing—1349. Doubts if the screws could be made with a square head to screw them by, and to be then cut off. Prefers Baskcomb's washers—1350. Mr. Hughes will produce plates of the size required—1352; piled complete, the port-hole to be afterwards cut out; encloses a report from Russia in favour of his system—1353–1355. Does not think a 9-inch plate in front would answer as well—1356–1358, 1361. It would not strengthen the weak girders—1359. Such a plate would cost 37*l.* a ton—1362. A great portion of the through-bolts may be done away with—1363. Understands that in a late trial the girders suffered severely—1364–1366. In all such matters prefers a whole plate; an entirety is better than two parts—1367.

LANCASTER, CHARLES WILLIAM—*cont.*

(*Second Examination*)—*cont.*

LEFROY, Brigadier-General JOHN H., R.A., President, Ordnance Select Committee. (*Analysis of Evidence.*)

Was not consulted as to the construction of the shields —162; heard of them six weeks before the trial—163. The two rounds on the 25th October were considered merely a preliminary test of strength—165. Does not think individual shots from a 9-inch gun at 400 yards would go through the shield—166. The 1½-inch plate is not in the best place; would employ T-girders instead of H-girders—167, 180. The shield would give substantial security against a 15-inch gun with a 60 lbs. charge; does not believe in 100 lbs. charges for ordinary service —168. The shield is an isolated cover for a gun, and irrespective of the parapet—169, 170. Would rather have 20 guns with this shield than 10 with one twice as strong and costly—172. Would have more iron, if cost permitted; in action such a blow would not be struck as in the trial—172. Does not consider the question of repairs as of much moment—173. More strength is desirable; it is a mere question of expense—174. A 9-inch gun, with carriage and platform, now costs 1,200*l.* —175. He himself would spend an extra 10 per cent. on the shield—176, 177. The salient fact in the trial was the snapping of 13 out of 28 bolts—178; which he attributes to bad manufacture—179. Would have a 6½-inch plate in front, and a 5½-inch plate behind, which would be really enough—180; though 7½ inches in front might be better—181–183. Would prefer a total thickness of 16 inches in two 8-inch planks, to a thickness of 13½ inches in plates of 6½, 1½, and 5½ inches—184. Believes that a shield for a foreign government was tried by Colonel Wilmot—185. Our 9-inch gun with a 60-lb. charge is a more powerful piercer than an American 15-inch gun with 100-lb. charges—186. Thinks a gun of 16 or 18 tons will be the largest for naval service—187; with a calibre of 10 or 11 inches—188. Doubts if a ship will come within 500 yards of a shield—190; because of the smoke—191. These shields afford sufficient protection to justify their erection—192. Considers the faults in the shield to lie in the thin plate not being between the other two, and mainly in the bolts [describes how the latter went]—193. A thickness of 20 inches would not interfere with muzzle-pivoting guns—194. Only objects to wood backing from its being perishable; it forms an admirable cushion—195. Wood might want renewing every 10 years; sees no great difficulty about it —196. Chalmer's backing, with end-on iron, filled up with wood, is very costly, but offers enormous resistance —197. It was complicated, 21⅜ inches thick in all, of which 15 were iron—198. Does not think the effect of a second shot on the same spot would be very disastrous—199. The previous fracture would increase the liability to danger; but a section rather exaggerates the damage; the bolts did not fly strongly to the rear—200. Any shield continually struck on one spot would in a short time give way, but it is most improbable—201. The resistance of a target in three thicknesses is more than the total resistance of the separate plates, but less than that of a solid plate of the total thickness—202. The 7-inch plates are excellent, as was also a 13-inch plate tried in 1865—204. Does not know its price—205. Does not understand bolts—206. Thinks eight shots from a 9-inch gun at 400 yards would disqualify this shield for a defence—207, 208. Doubts if a vessel in motion would do this in half a day—209. Good wrought-iron is better than steel for front, middle, or back plate. The back should be highly extensible—210. The back plate most needs the best iron—211.

MALLET, ROBERT, F.R.S. (*Analysis of Evidence.*)

Has not seen Gibraltar shield, nor the experiments with it—1187–1189. The construction embraces almost every undesirable quality—1190, 1222. Guns being muzzle-pivoting, the embrasure ought to be but little larger than the muzzle; masonry surrounding shield should be a circle, not a rectangle. There should be no abrupt changes of form in the iron-work; no rigid connection between the iron and stone-work; no absolutely rigid fastenings in the iron-work itself. There must be com-

MALLET, ROBERT, F.R.S.—*cont.*
pressible backing; describes the disc arrangement he proposes for the porthole, and its advantages. Thinks investigation is called for as to the best sort of stone for batteries; granite is not suitable—1191. Trap rocks are tougher and more resistant; describes a proper test for stones—1192. Such rocks need not be excessively costly 1193, 1215. Calls attention to the fact that any elongated projectile passing from air to a denser medium curves in its course; would apply this principle by putting a few feet of resisting material before the final stopping face of a fort to turn a shot round as it buried itself —1193. With shell, must take the chance, unless front plate kept it out—1194. Every open battery should have rudimentary casemates—1195, of stone as a resource when the legitimate material, earth, cannot be employed —1196, 1197. The front of his shield is circular—1198, with a small porthole—1199, describes the arrangement —1200–1203. Some of the width should be obtained by the masonry—1204. His shield would be independent of the masonry—1205; mode of fixing detailed—1206. It could not fall forward, fitting into a groove, as it were, in the masonry; renewal would be simple—1207, 1208. No iron box, built directly into contact with masonry can stand a heavy cannonade—1209. The shield would not be recessed in the masonry more than 3 or 4 feet—1210, 1211. The gun, or, in its absence, an iron shutter would keep out splinters—1212. Never saw a shutter made properly–1213. Experiment has shown the advantages of millboard over teak for backing; it could be supplied at 30*s.* a ton—1214. Trap-rock exists in large quantities in the United Kingdom—1216. Has built bridges of trap-rock—1217. The working might be a little more expensive than granite—1218, 1219. Rubble granite may make stronger wall than large blocks—1220; but this would not apply to less brittle material—1221.

MALTA.
A favourable place for the less powerful class of shields —*Burgoyne*, 21.
By torpedoes ships could be kept 400 yards off—*Jervois*, 53–56.
A large ship might approach within 100 yards of any part of the sea-face—*Robinson*, 267.

MANTLET.
Wadded, would protect the gunners from loose bolts or fragments—*Wilson*, 1329–1334.

MILLBOARD. *See* BACKING.

MOULD.
Definition of—*Ellis*, 706.

NOBLE, Captain WILLIAM HENRY, R.A. (*Analysis of Evidence.*)
The great defect in the Gibraltar shield was that the fastenings did not hold. Considers two or three thick plates bolted together nearly equal in resistance to a solid plate of same thickness—469, 494, 495. Details experiments proving this; three 5-inch plates rivetted together would equal a solid 13-inch plate—470, 475, 509–512. The term "laminated" applies to thin plates or scales—471; not to a compound structure of thick plates —472. The resistance of plates, up to 5½ inches, varies as the square of the thickness; beyond that, especially with pointed projectiles, the rule is less distinct—473, 513. In a compound structure, as compared with a solid plate of equal thickness, the resistance exceeds the sum of the separate resistances—474; but would have the outside plate at least 8 inches thick—476. Wood-backing is of the utmost advantage to a shield and to its fastenings; its perishing must be guarded against—477. A backing is the best protection to the bolts—478. The amount of weakness from a previous shot depends on the nature of the blow struck by that shot—479. Experiments against iron land defences have not been sufficiently carried out; ordnance is much increased in power since the trial of the Inglis plank-upon-plank shield—480, 481, 484, 504–506. Describes an indecisive experiment, in 1865, with a Chalmers' target *versus* a solid 13½-inch plate—482. Strength of a shield should be irrespective of the thickness of the rest of the parapet —483, 485. Would punch shields made like armour-plated vessels, but would rack solid structures—486. Does not consider the Gibraltar shield strong enough for the purpose intended—487. Would prefer to reconstruct it, and introduce a backing; to strengthen present structure would have an extra 5-inch plate on the outside, or an 8-inch plate in place of the present 5½-inch—488, 498, 499. The backing known as Campbell's, or Chalmers', should be incorporated in any system of iron defence [details the principles on which he would construct a shield]; would use Palliser bolts; shape should be semi-circular, should never be recessed; all iron forts should be as low as possible—489. Has not computed the cost —490, 491. Reasons for making trials at short ranges with reduced charges—492. Mode of calculating velocities—493. In the Gibraltar shield there are two very weak points beside the embrasure—496, 497. Why a shield should not be recessed—500. Should be semicircular because nearly every shot would strike at an angle— 501, 502. Cannot say what difficulty such a shape might cause as regards backing—503. It might have been better to have put the thin plate in the middle—507, 508. A shot's tendency to wabble depends upon the rifling and windage—514–516. Thinks chilled-iron backing plates would be worth trying—517, 523. With rigid back every bolt feels the shot—518; and is, therefore, theoretically less tried—519–522. Cast-iron backing did not succeed—524, with a thin iron-plate in front— 525; and against small guns—526. Does not think that the Gibraltar shield fairly represents the plank-upon-plank system—527. Relative power of 9-inch and 10-inch rifled guns—*Appendix* XV.

OAK. *See* WOODS.

ORDNANCE SELECT COMMITTEE.
Report of trial of Gibraltar shield—*Appendix* iv, v.
Experiments in 1865 on two shields—*Appendix* xv.
Abstract of velocities of various projectiles fired Gibraltar Shield—*Appendix* xxi.

PALLISER, Major. (*Analysis of Evidence.*)
Attributes the failure of the bolts to their heads being formed by "jumping" the iron, instead of by drawing down the bolt; bolts formed in the latter way have withstood much battering—528, 535, 545, 546. The bolts were not screwed up too tightly—529; they have a tendency to snap where nipped by the shearing of the plates; would obviate this by reducing the shank still further. Elastic washers are a positive disadvantage; the whole structure should be screwed up as tight as possible—530. A sufficient length of bolt should be reduced thinner than any other part, to stretch; good iron will stretch 20 per cent.—531. In the forthcoming experiments, thinks that some bolts will break in the screw-thread, which would be prevented by reducing the shank—532–534. When plates, with surfaces not quite plane, are in close contact, there is a tendency to shear—536, 538; but the mere rigidity does not tend to break the bolts—537. Plates separated by backing are in contact if on horizontal stringers—539; but their lateral motion would only bend the bolts—541. In Gibraltar shield, the shearing will be much modified by rounding off the bolt-holes—540, 542. Bolts can be made to hold together a perfectly rigid structure—543, 544. Disbelieves in a bolt breaking by jar or vibration; sometimes it must either stretch or break—544. Thinks a bolt may have as great a strain as possible by the bulging of the inner skin of a target—547.

PENETRATION.
Quantities necessary for ascertaining the law of— *Bashforth*, 1162–1164, 1181, 1184. Does not think penetration of a shot varies inversely as the circumference— *ib.* 1179. The effect of obliquity in the shot is for experiment entirely—*ib.* 1182; but it will tell much in practice—*ib.* 1183.
Relative penetration of 9-inch and 10-inch guns— *Noble, Appendix* XV.

PITCH, TRINIDAD.
Proposed for packing a stringer backing—*Hughes*, 365; is inflammable—*ib.* 366.

PLANKS.
16½ inches wide cost 18*l.* per ton—*Hughes*, 399, 400.
On face of a shield should be 7 to 8 inches thick— *Inglis*, 100, 101. Can be made perfect up to 6½ inches thick—*ib.* 131.
Defined as of about or under 18 inches width; the terms not interchangeable with "plate"—*Jervois*, 74–78.
Not more difficult to make, nor more expensive than plates—*Wilson*, 593–596. Would cost within 1*l.* per ton as much as plates—*ib.* 637.

PLATES.

1. *Generally.*
2. *Chilled-Iron.*
3. *Grooved.*
4. *Hardness and Softness.*
5. *Manufacture.*
6. *Price.*
7. *Tests.*
8. *Thickness.*
9. *Unbacked.*

1. *Generally.*

Buckling slight in plates of 5 to 7 inches—*Clay*, 1110–1112; but thick plates buckle less than thinner plates—*ib.* 1113, 1114; does not think they crack more—*ib.* 1115–1118; or are more distorted at the back—1119.

Thick plates crack instead of buckling—*Hood*, 1073–1076. Describes a good fracture—*ib.* 1082.

Prefers a solid plate to two plates making the same thickness—*Hughes*, 331.

Mass of iron to receive a blow should be as large and thick as possible, in a single plate—*Wilmot*, 241, 248.

Softest are best—*Wilson*, 578–580. Has no special modes of measuring the hardness—*ib.* 617, 618. Hardness and toughness are very difficult to obtain together—*ib.* 619–621. Crystals appear where violent fracture occurs—*ib.* 610–612.

2. *Chilled-Iron.*

Would not have a great thickness in front—*Wilmot*, 243. Would be worth trying, without wrought-iron in front; but the thickness would impede the working of the gun—*ib.* 251, 252.

3. *Grooved.*

Manufacture described—*Wilson*, 1229–1232, 1275. Density would be uniform—*ib.* 1236, 1237. Depth of groove 5 inches—*ib.* 1238. Does not think the grooves could be a source of weakness—*ib.* 1239, 1240.

4. *Hardness and Softness.*

Hardness due rather to chemical than manufacturing reasons—*Clay*, 1123, 1152. Hammered plates hitherto made hard because of scrap-iron—*ib.* 1126. Determinable mainly by experience—*ib.* 1129; mechanical tests useless—*ib.* 1130–1133. Fracture shows hardness—*ib.* 1134, 1135.

Would have hard iron in front with, if possible, a harder surface—*Wilmot*, 242.

5. *Manufacture.*

Can now make plates 17 by 4 feet, and 10 inches thick—*Clay*, 1086; could easily increase to 7 feet wide—*ib.* 1087: with equally good welding—*ib.* 1088. Difficulty in procuring uniformity depends more on thickness than width—*ib.* 1089. The proper rolling down to any thickness is a mere question of machinery—*ib.* 1109, 1121. At present thick plates are of worse quality than thin—*ib.* 1120. Has some doubt whether, in our desire for perfect welding, we do not sacrifice tenacity, which hammering and rolling in combination might retain—*ib.* 1123. A brittle plate re-rolled from 8 inches to 5 inches was much improved in toughness and tenacity—*ib.* 1124, 1125. Hammered plates should be afterwards rolled—*ib.* 1127, 1128. Fibrous plates may become crystalline in process of manufacture—*ib.* 1133. Could undertake to make a good hammered plate to cover the shield, 12 by 8 feet, and 18 inches thick—*ib.* 1142, 1143, 1145–1147, 1150; less costly than rolled plates—*ib.* 1143. Hammering gives more solidity than rolling—*ib.* 1151. With existing machinery must make a shield in two plates—*ib.* 1153.

No difficulty in making a 10-inch plate up to 30 feet by 4½ feet—*Ellis*, 684; there is difficulty in heating a greater width—*ib.* 685–688, 703, 705. Has rolled a 13½-inch plate 6½ feet wide—*ib.* 702. Has made many 10-inch plates and one 15-inch plate perfectly solid—*ib.* 704. Defines a "mould"—*ib.* 706. Can roll 15-inch plates perfectly sound, 4 feet wide, and of any length—*ib.* 709–710. Trustworthy plates cannot be forged wide enough to form the shield in one piece—*ib.* 734–739. Softest and toughest iron is best—*ib.* 744. Welding has of late improved—*ib.* 745, 746; can ensure its goodness up to 10 inches—*ib.* 747. Could not make sound 13-inch plates 8 feet wide—*ib.* 753; but could manage a 6-inch plate of that width—*ib.* 754–756.

Return of quality of plates tested at Shoeburyness—*Harrison, Appendix* xiii.

Never saw Brown's or Cammell's plates peel off in layers; other plates have done so—*Hood*, 1079. Experiment on a 10-inch plate—*ib. Appendix* xiv.

PLATES—*cont.*

5. *Manufacture—cont.*

No difficulty in making plates of good quality up to 10 inches thick at from 30*l.* per ton for 5-inch to 35*l.* per ton for 10-inch plates—*Hughes*, 332–334. Could roll a plate 7½ feet wide at a slightly increased expense—*ib.* 335–337; would undertake a plate 20 feet by 9½ feet at 40*l.* a ton—*ib.* 338–343, 402. At this moment can roll 6 feet wide—*ib.* 391; (with six weeks to prepare—*ib.* 392–395). In proportion to size, no more waste in rolling large than small plates—*ib.* 396–398.

Mr. Hughes will produce those required for strengthening Gibraltar shield—*Lancaster*, 1352; piled complete, port-holes afterwards cut out—*ib.* 1353–1355.

7-inch are excellent; as was also a 13-inch plate tried in 1865—*Lefroy*, 204. Does not know price—*ib.* 205.

Improvement in of late—*Robinson*, 285. Firms which supply the Admiralty—*ib.* 286–288.

Manufacture described—*Wilson*, 559. With special plant could roll a plate large enough to cover the shield; but at great cost—*ib.* 567–569, 638–640; it would take 7 or 8 months to prepare such plate—*ib.* 641. With present plant could roll a plate 6½ feet wide—*ib.* 570; and of equable quality to 15 inches thick—*ib.* 571. To increase the width to 8 feet would greatly add to the cost, and would lessen the certainty of the welding—*ib.* 572. Has obtained good welding up to 10 inches—*ib.* 581, 582; never now has a plate badly welded—*ib.* 583–585. Are making plates for Admiralty, 19 by 3 feet, and 10 inches thick—*ib.* 634, 635; at 36*l.* per ton—*ib.* 636. Can make plates 5½ feet wide; 10-inch plates 3 feet wide, up to 25 feet long—*ib.* 649. In making a 15-inch plate should pile the whole plate and cut the port-hole afterwards—*ib.* 1253. Could now roll a 12-inch plate up to 5 feet wide—*ib.* 1279. Can roll a 15-inch plate of good quality 4 feet wide—*ib.* 1301–1303. Could make a plate 12 by 8 feet with proper machinery—*ib.* 1315. Furnaces must be altered—*ib.* 1317–1320.

6. *Price.*

5-inch or 6-inch plates cost 29*l.* or 30*l.* a-ton, and price increases roughly by 1*l.* for each inch of thickness, or foot of width over 4 feet—*Clay*, 1092. Plates 12 feet by 8 feet, and 18 inches thick (hammered), at, for a quantity, 30*l.* to 35*l.* a ton—*ib.* 1148, 1149.

5-inch from 28*l.* to 29*l.* per ton; 7-inch, 30*l.*; 10-inch, 36*l.*; 15-inch, 42*l.* 10*s.*—*Ellis*, 761, 762.

4 feet wide, 28*l.* to 30*l.* a ton—*Hughes*, 401.

Increases rapidly above 5½ inches thick—*Jervois*, 26.

9-inch thick, and 12 feet by 8 feet, with bolt-holes and port-hole cut, 37*l.* a ton—*Lancaster*, 1362.

Is using 9-inch plates at 33*l.* a ton—*Robinson*, 273; 5-inch plates, 30*l.*; 10-inch plates, 36*l.*—*ib.* 289.

Per ton, 7-inch, 30*l.*; 8-inch, 31*l.*; 9-inch, 33*l.*; 10-inch, 36*l.*—*Wilson*, 648. Grooved plates—*ib.* 1233–1235, 1245. A solid 13-inch plate, 12 feet by 8 feet, would cost over 1,500*l.*—*ib.* 1248, 1249, 1251. Cost of a 12-inch plate—*ib.* 1278, 1279, 1281–1283, 1316. Progressive price according to thickness—*ib.* 1298–1300; and to width—*ib.* 1304–1312, 1313, 1314.

7. *Tests.*

Usual test at Portsmouth described—*Hood*, 1033–1035.

System adopted by the Admiralty—*Robinson*, 289, 290.

Test experiments on plates for Gibraltar shields, *Appendix* vi, viii.

8. *Thickness.*

We do not yet know what is necessary for a lasting defence—*Alderson*, 296. Has seen good 9-inch large plates; good small plates thicker—*ib.* 300; sees no difficulty in obtaining good 9-inch plates—*ib.* 301.

Need not be so great as the calibre of attacking gun—*Chalmers*, 815. It is a disadvantage in a thick plate to be so difficult to fasten; quality does not improve with thickness—*ib.* 776. A thick plate may not be penetrated, but cracking is as harmful—*ib.* 777, 778. The outer plate should be just strong enough to break up the heaviest shot brought against it—*ib.* 822. Would rather have a 6-inch plate in front, and put any extra thickness in the second plate—*ib.* 823; but if everything were arranged except the outer plate, would rather have that thick than thin—*ib.* 824.

With suitable machinery, sees no limit to practicable thickness—*Clay*, 1090.

Would not have a face-plate thinner than 10-inch—*Ellis*, 683.

With solid backing, need not be as thick as planks—*Inglis*, 102, 103. 5½-inch plates do not resist so well as 7¼-inch planks—*ib.* 104. Does not think any plate tried at Shoebury, thicker than 7 inches, has been thoroughly welded—*ib.* 127–130; should not be laminated instead

PLATES—*cont.*

3. *Thickness—cont.*

of welded—*ib.* 133, 134. Special experimental plates are not specimens of general manufacture—*ib.* 132.

Does not think a shot could break up a 9-inch plate, backed by a 5-inch plate—*Hood*, 1062.

Outside plate in a compound structure ought to be at least 8 inches—*Noble*, 476.

Against a 12½-ton gun at 100 yards, the least should be 10 or 12 inches in one solid plate—*Robinson*, 268, 269; such plates can be produced in the trade—*ib.* 272, 274. Resistance increases as the square of the thickness—*ib.* 284, 285. To resist a gun the thickness should exceed the calibre—*ib.* 290.

Outer plates should be at least 10 inches—*Wilmot*, 255, 259; but could not well be too thick—*ib.* 256. The gun could be worked behind 18 or 20 inches—*ib.* 257, 258. Has fired at very good 8-inch plates—*ib.* 260.

Up to 9 inches as good in quality as thinner ones—*Wilson*, 589, 590. Can depend upon their being fibrous and soft—*ib.* 591, 592. Plates of varying thickness can be made of uniform quality—*ib.* 669. Could make a 15-inch plate, if he had proper machinery—*ib.* 1252.

9. *Unbacked.*

11-inch plate destroyed by a single shot—*Chalmers*, 772–775. 13½-inch plate broken through, 7-inch plate broken through by a 7-inch Palliser shot. A solid 13-inch plate required to resist the mere penetration of a 12-inch gun—*ib.* 776. A 12-inch rifled gun or a 15-inch Rodman would overcome 15-inch plates in 4 shots within a radius of 4 feet from centre of port-hole—*ib.* 777, 778.

POPLAR. *See* WOODS.

PORT-HOLE.

Smallness is equally advantageous in a built-up shield as in a thick plate—*Chalmers*, 776.

Puts an extra 6-inch plate round the—*Lancaster*, 876.

Disc arrangement suggested—*Mallet*, 1191.

PROJECTILES.

Of Palliser shot, the more pointed did more damage—*Hood*, 1027, 1028.

A shot's tendency to wabble depends upon the rifling and windage—*Noble*, 514–516.

Velocities of—*Appendix* xxi.

RANGE.

Doubts if a ship will come within 500 yards of a shield—*Lefroy*, 190; because of the smoke—*ib.* 191.

REFRACTION.

A shot which passed through a 6-inch plate and 40 inches of wood backing struck with its point a plate 20 feet in the rear—*Hood*, 1038.

Any elongated projectile passing from air to a denser medium curves in its course; application of the principle in protecting forts—*Mallet*, 1193, 1194.

RESISTANCE.

"Plank upon plank" system resists nearly as well as solid plate—*Alderson*, 299.

Air. To heads of shot of various forms, the difference very small—*Bashforth*, 1158. Experiment proposed to test resistance of laminated, compared with solid plates—*ib.* 1168. Law of resistance only holds when velocities are just sufficient for penetrating plates; does not hold in plates behind each other, because there is a loss of force in penetrating the first plate—*ib.* 1169–1173. Law not determined for resistance of plates supported only at the ends—*ib.* 1174. Experiments should begin with small guns and thin plates—*ib.* 1175, 1176, 1180.

Would rather absorb the shot's work than resist it by mere hardness and thickness—*Chalmers*, 821, 824.

Proportionate increase of strength in thicker plates depends upon the fibre being rolled down to the same toughness as in thinner plates—*Clay*, 1107–1109, 1121. Plates condemned as against 68 lb. shot at low velocity satisfactory against hard projectiles at high velocity—*ib.* 1137; though latter made deeper indent—*ib.* 1138.

A 10-inch plate and a 5-inch plate would resist well two Palliser 9-inch shots close together—*Ellis*, 678–680.

Cannot give the thickness of plate to resist a given gun—*ib.* 682. Two 5-inch plates would equal in resistance a 7½-inch plate—*ib.* 689–691.

With good plate of given thickness penetration by a gun of same calibre will be just resisted—*Hood*, 1040–1043.

A shield should bear several shots within a small area *Inglis*, 136.

RESISTANCE—*cont.*

Doubts the uniform rule of increase beyond 5½ in[ches]—*Jervois*, 26.

Prefers anvil-like resistance to absorption of power by a more yielding substance—*Lancaster*, 892. Two contiguous loose plates not so strong as two rigidly connected—*ib.* 915, 916, 918.

Strength of three thicknesses exceeds the aggregate resistance of the separate plates; but is less than that of a solid plate of the total thickness—*Lefroy*, 202.

Two or three thick plates bolted together nearly equal a solid plate of the total thickness—*Noble*, 469, 494, 495. Three 5-inch plates riveted together would equal a solid 13-inch plate—*ib.* 470, 475, 509–512. Up to 5½ inches the resistance varies as the square of the thickness—*ib.* 473, 513. In a compound structure, as compared with a solid plate of equal thickness, the resistance exceeds the sum of the separate resistances—*ib.* 474.

A shield should be more than equal to resisting any gun which could be brought against it—*Wilmot*, 232.

Doubts the uniform law beyond 5 or 5½ inches—*Wilson*, 586; but cannot say exactly where the rule ceases—*ib.* 587, 588.

RIGIDITY.

Has not seen a rigid structure, wholly of iron, [do] well—*Alderson*, 322.

Bolts may be made to stand in a rigid target, without wooden backing—*Baskcomb*, 989–992. Prefers the elastic principle—*ib.* 994, 995.

Too much is a fault—*Chalmers*, 791.

There should not be rigid connection between iron and stonework, nor absolutely rigid fastenings in the ironwork itself—*Mallet*, 1191.

Every bolt feels the shot—*Noble*, 518; and is therefore, in theory, less tried—*ib.* 519–522.

Entire structure should be screwed up as tightly as possible—*Palliser*, 530. Mere rigidity does not tend to break bolts—*ib.* 537. Bolts would hold a perfectly rigid structure together—*ib.* 543, 544.

ROBINSON, Vice-Admiral R. SPENCER, Controller of the Navy. (*Analysis of Evidence.*)

We may go up to 23 or 24-ton guns, but 12½-ton are the largest trustworthy guns at present—266. At Gibraltar there are few places where a large ship can approach within 800 yards, but it could get within 100 yards of any part of the sea-face of Malta—267, 270. In the latter case, the least thickness of plate should be 10 to 12 inches, in one solid plate—268, 269. Wooden backing is undesirable, but indispensable—270, 271, 2[73]. Believes that plates of 10 to 12 inches can be produced in the trade—272, 274. Is now using for ships 10-inch plates and 9-inch plates in large quantities; the latter at 33*l.* a ton—273. No backing as yet has equalled wood; in the "Hercules" target, the wood backing saved the structure—275. At Gibraltar, a turret-ship of light draught might approach much nearer—277, 278, 283. Since the "Warrior," all iron ships in the Navy have been built with iron stringers—279. The principle is the same as in the Chalmers target; it affords a valuable stiffening and support—280; but the stringers would not save the skin, without wood between it and the front plates—281. The resistance of a plate increases as the square of its thickness—284, 285. The 8-inch and 9-inch plates, now supplied, are perfectly good—285. Only four firms can now make really good plates—286; their names—288. Admiralty does not procure plates by open competition—287. The price of 5-inch plates is 30*l.* a ton; of 10-inch plates, 36*l.* a ton. Details the tests to which plates are subjected—289, 290. To resist a rifled gun, a plate is required thicker than the projectile's diameter; to batter a plate, gun's calibre should exceed plate's thickness—290.

RUSSIAN SHIELDS AND FORTS.

Have over 2 feet of iron for very exposed positions—*Burgoyne*, 2.

Are stronger than the shield he has for trial at Shoeburyness—*Hughes*, 418, 419; and doubly as costly—*ib.* 420, 423. If expense is no object, their system is preferable—*ib.* 421, 422. Their system described—*ib.* 424, 428, 430–437, 439–444, 453, 457. Thinks it a good construction, and a good application of iron—*ib.* 445–447; but would put a thicker plate in front—*ib.* 448. Does not think a heavy shot would disrupt the whole shield—*ib.* 449. Will cost more than 2,000*l.* a gun—*ib.* 450–45[3]. Such a structure might be made with plates firmly welded together, and corrugated—*ib.* 459; with parallel stringers—*ib.* 460; it need not be very costly—*ib.* 461.

USSIAN SHIELDS AND FORTS—*cont.*

In granite forts, the Russians use iron embrasures, with corrugated cheeks to keep out shot, for all guns facing sea, and open to attack by ironclads *ib.* 462; thus adapting iron to old fortifications—*ib.* 463. It is an expensive mode, and might be improved upon—*ib.* 465. They are making new forts, miles out to sea, in advance of their old positions—*ib.* 464.

Has cost 3,000*l.* per gun—*Jervois*, 45.

Mr. Lancaster's system approved—*Lancaster*, 1355.

HIELDS, GENERAL PRINCIPLES OF.

Would have the front plate as thick as it could well be made—*Alderson*, 299. Would have a plate of 8 or 9 inches in front, horizontal stringers filled in with wood, a skin-plate, and a backing—*ib.* 313–315. With two plates would not have them in contact—*ib.* 320; but wood between—*ib.* 321.

Doubtful whether a back plate helps a front plate to resist a shot—*Bashforth*, 1177, 1178.

Is not aware of the relative proportion between strength of shields and power of guns—*Baskcomb*, 963, 964. The most elastic shield stands best—*ib.* 978.

Why they need not be so perfect as ship's sides—*Burgoyne*, 1. Would have two classes—*ib.* 2, 16. It is desirable to find the least expensive cover for guns on shore—*ib.* 4, 17. Perfect immunity is of less consequence on an extended front—*ib.* 5, 20,

The greater the thickness the longer the time obtained to resist the shot's penetration and the greater area at the back does the shot operate on—*Chalmers*, 766. Would divide the resisting parts into two portions, connected by ribs of iron or, preferably, soft steel, filled with a concrete backing—*ib.* 767. Such a structure would much confine a shell; and would relieve the fastenings of much work—*ib.* 771. Front plate need not be as thick as the calibre of attacking gun—*ib.* 815. A built-up target with a good backing resists better than the same thickness of iron in a solid plate—*ib.* 824.

Against powerful modern artillery, backing and two plates are required—*Ellis*, 732; the front plate to be as thick as possible—*ib.* 733. The two series of plates should cross—*ib.* 734. Could easily cover the shield with two plates—*ib.* 741, 742. The strength needed depends on the position of the shields—*ib.* 743. The supports might be of solid iron, with the screws screwed right into them—*ib.* 752.

Should be in classes according to intended position. For a place where ships come within 100 yards, would have 9-inch plate in front, 5-inch plate behind it, then 6 inches of wooden backing, and an iron skin. No shot would penetrate that—*Hood*, 1056, 1063. At 200 yards in action striking is quite a chance—*ib.* 1049, 1050. A ship passing might hit with one shot in six or seven—*ib.* 1051. A turret-ship has the less smoke to contend with—*ib.* 1085.

Would divide into four classes, according to position—*Hughes*, 330, 356. War Office has, for experiment, one constructed by witness—*ib.* 323. Its nature—*ib.* 325, 326, 329; weight—*ib.* 326; as compared with Gibraltar shield—*ib.* 327, 328. His principle is a thick plate in front—*ib.* 344, 345; then horizontal stringers as deep as plate is thick—*ib.* 349, 355, 357; next a thin plate, and then vertical stringers—*ib.* 351–354. A coating of plates could be hereafter added without interference with structure—*ib.* 387, 388. Would avoid lamination in every possible way—*ib.* 429.

There should be some consistency of strength with adjacent works—*Inglis*, 148, 149. A substitute for masonry—*ib.* 150. If a shield held out, its gun would be effective, though the masonry crumbled—*ib.* 151.

The great function of a battery is now to protect the torpedoes—*Jervois*, 27. Necessity for avoiding unnecessary joints—*ib.* 46, 47. Very few shot would hit a shield in naval action—*ib.* 57–59.

An iron embrasure should be perfect *per se*—*Lancaster*, 831–834, 862. Ought to be 14 inches of iron—*ib.* 836, 837; unbacked—*ib.* 838. Front plate, 12 inches; any backing of iron—*ib.* 839, 840. His system involves much iron, and is costly, but saves nine-tenths of the bolts—*ib.* 846; and, from its security, is worth its cost—860, 861. Such an embrasure has been fired at satisfactorily, in model, before Russian officers—848, 849. Formation of his fort described—*ib.* 863–869, 880, 881; and of embrasure—883–890.

Is an isolated cover for a gun, and irrespective of the parapet—*Lefroy*, 169, 170. Does not consider the question of repairs as of much moment—*ib.* 173. Would have a 6½-inch plate in front, and a 5½-inch plate behind, which would be really enough—*ib.* 180; though 7¼ inches in front might be better—*ib.* 181–183; but would prefer

SHIELDS, GENERAL PRINCIPLES OF—*cont.*

a total thickness of 16 inches, in two 8-inch planks, to a thickness of 13¼ inches in plates of 6½, 1½, and 5½ inches *ib.* 184. A thickness of 20 inches would not interfere with muzzle-pivoting guns—*ib.* 194. Any shield struck continually on one spot would soon give way, but such shooting is most improbable—*ib.* 201. The back plate should be highly extensible—*ib.* 210. It most needs the best iron—*ib.* 211.

Points which witness considers essential in a shield—*Mallet*, 1191. Front circular—*ib.* 1198; port-hole small—*ib.* 1199; general arrangement—*ib.* 1200–1204. Independent of the masonry—*ib.* 1205; how held in position—*ib.* 1206–1208. No iron box, built directly into contact with masonry, can stand a heavy cannonade—*ib.* 1209. Recessed 3 or 4 feet in the masonry—*ib.* 1210, 1211. The gun or a shutter would keep out splinters—*ib.* 1212.

Strength should be irrespective of the thickness of the rest of the parapet—*Noble*, 483, 485. Details principles on which he would construct; shape should be semicircular; should never be recessed; iron forts should be as low as possible—*ib.* 489, 500, 503. Has not computed the cost—*ib.* 490, 491. Weakness from a previous shot depends on the sort of blow struck—*ib.* 479. Would punch a shield made like an armour-plated vessel, but would rack a solid structure—*ib.* 486. Term "laminated" applies to thin plates or scales—*ib.* 471.

Of iron wholly, did not stand a heavy shot—*Wilmot*, 250.

Solid plates, sufficiently thick, are better in immediate contact than with backing between—*Wilson*, 562. Chief object of back plate is for bolting the girders—*ib.* 603. Front plate should be thick—*ib.* 607. Designs for shields with tongue-and-groove plates, together 13 inches thick—*ib.* 1224–1228, 1241–1244, 1246, 1247, 1254–1274, 1277, 1284–1286.

SHOT.

Chilled-iron. The head is rarely destroyed; the part which fails to penetrate breaks up—*Wilmot*, 261–265.

SHUTTER.

Proposed, to keep out splinters—*Mallet*, 1212. Never yet saw one properly made—*ib.* 1213.

STEEL.

Has no experience to justify his preference of over iron for backing cells—*Chalmers*, 788.

Inefficient for bolts—*Ellis*, 724, 725.

Inferior to iron for plates; has failed to make a 7-inch steel plate. Krupp has failed also——*Wilson*, 651–654.

STONE.

Necessity for ascertaining best sort for batteries—*Mallet*, 1191; how it should be done—*ib.* 1192. Would not use stone if earth could be employed—*ib.* 1196, 1197.

SUMTER, FORT.

Effects of bombardment by monitors described—*Jervois*, 35.

TORPEDOES.

Principal function of a modern battery is to protect—*Jervois*, 27.

TRAP-ROCKS.

Suitability for batteries—*Mallet*, 1192; need not be excessively costly—*ib.* 1193, 1215. Exist in the United Kingdom in large quantities—*ib.* 1216. Has built bridges of—*ib.* 1217. Working might be slightly more expensive than granite—*ib.* 1218, 1219. Large blocks would be best—*ib.* 1221.

VELOCITY.

Experiments for calculating law of, for elongated projectiles at any distance from the gun with initial velocity given—*Bashforth*, 1159–1161. With a given penetration there is a greater loss of *vis viva* with high than with low velocity—*ib.* 1165–1167.

Velocities of Projectiles fired against Gibraltar Shield, *Appendix* xxi.

VINCENNES, TRIALS AT.

How the shot jammed in the backing—*Chalmers*, 768–770. Colonel Younghusband and Captain Hore reported on the experiments—*ib.* 795.

WASHERS.

Admiralty washer assists the nut—*Baskcomb*, 993.

"Admiralty" iron, good results of—*Hood*, 1048.

Uses Baskcomb washers—*Hughes*, 374.

WASHERS—*cont.*

Would probably save the bolts in a shield—*Inglis*, 118–122.

Essential—*Lancaster*, 842. Prefers Baskcomb's—*ib.* 1350.

Considers elastic washers a positive disadvantage—*Palliser*, 530.

The bolts in Gibraltar shield might have stood better with elastic backing—*Wilmot*, 236.

WILMOT, Colonel F. EARDLEY, Royal Artillery, Commandant, School of Gunnery, Shoeburyness. (*Analysis of Evidence.*)

Supervised the firing of two rounds at the shield—212. On 25th October the Gibraltar shield was fired at by a chilled-iron Palliser shot of 248 lbs., from a 9-inch 12-ton rifled gun, with 37 lbs. of large-grained W. A. rifle powder—214, 215. Details the damage inflicted in the two rounds—216, 217. Thinks the shield might have been stronger, for the quantity of iron in it—219. It did not stand well; 16 bolts were driven off—220. Attributes the absolute effect to the bolts giving way, and to faulty construction—221, 234. The plates appeared well made—222. Thinks the bolts failed from the system of insertion—223. Motion of the plate nipped and almost sheared them—224. The bolts were conical-headed—225; and countersunk, but they fitted too tightly—226, 235. Thinks the whole construction faulty, but expected greater effect from the gun—227–231. The gun was not of a heavier character than would be used against fortifications—229, 230. A shield should be more than equal to any gun brought against it—232. Does not think there was sufficient iron in the shield—233. The bolts might have stood better with an elastic backing—236. Sees no objection to wood backing for shields—237. A shield could not be replaced without much expense and trouble—238. If bolts must be used, they should be fewer and much larger—239. The striking velocities of the shot were 1,276 and 1,275 feet—240. The mass of iron to receive a blow should be as large and as thick as possible in a single plate, and bolts should be got rid of altogether—241, 248. Would have hard iron in front, with, if possible, a harder surface—242. Would not have a great thickness of chilled iron in front—243. Chilled iron might be useful for the backing—245. The plates were not bedded close together—246; from a slight curvature—247. Had an experimental target, wholly composed of iron—249. It did not stand a heavy shot—250. Has lately fired at blocks of chilled iron without any wrought-iron in front—251. Shields so made would be worth trying, though the working space for the gun is seriously diminished by the thickness—252. Has had no experiments on wrought-iron backed by chilled iron—253, 254. Outer plate should be 10 inches—255, 259; but could not well be too thick—256. The gun could be worked behind 18 or 20 inches—257, 258. Has fired at very good 8-inch plates—260. The head of a chilled shot is rarely destroyed, but that part of the shot breaks up which fails to penetrate—261–265.

WILSON, GEORGE (Cyclops Iron and Steel Works, Sheffield). (*Analysis of Evidence.*)

Is Managing Director of the Cyclops Works, Sheffield, of Messrs. Cammell and Co.—548. The plates in the Gibraltar shield were reduced to their present thickness to bring the cost down to a given sum. On the system adopted, extra armour could at any time be added—550. The thickness originally designed was 15 inches—551. Will produce the designs showing the alterations—552. Made the bolts as well as the armour—553. Had no communication with Major Palliser as to the bolts—554. Had no experience or special knowledge in making shields—555–558. Describes the manufacture of the plates—559. Considered the bridge sections in the original design a source of danger—560, 561. Solid plates, sufficiently thick, are better in immediate contact than with backing between—562; but bolts are a great source of weakness—563; and should be dispensed with, if possible—564, 565. If used, the shearing action ought to be prevented—566. With special plant, could roll a plate large enough to cover the shield; but at great cost—567–569, 638–640. It would take seven or eight months to get the plant ready for such plates—641. With present plant could roll a plate 6½ feet wide—570; and of equable quality to 15 inches thick—571. To increase the width to 8 feet would greatly add to the cost, and would lessen the certainty of the welding—572. Increased thickness adds materially to the cost, weight for weight—573. Thinks the bolt-holes might be counter-sunk as a palliative to shearing—574–577. Still thinks the softest plates the

WILSON, GEORGE—*cont.*

best—578–580. Has obtained good welding up to 10 inches—581, 582. Never now has a badly welded plate—583–585. Doubts the uniform law of resistance beyond 5 or 5½ inches—586. Cannot say precisely where the rule ceases—587, 588. Plates up to 9 inches thick are as good in quality as thinner ones—589, 590. Can depend upon them being fibrous and soft—591, 592. Planks would not be more difficult to make, nor more expensive, than plates—593–596. To strengthen the Gibraltar shield would add 6 inches of iron armour between the skin plate and the intermediate plates—597–602, as cheaper than putting a thicker plate in front—604. The chief object of the back plate is for bolting the girders—603. Has only read portions of Report of Iron Plate Committee—605, 606. For new shields, would prefer a thicker front plate; would endeavour to do away with bolts, and to obviate shearing—607. Describes the making of the bolts—608. Cannot discover that upsetting the bolt's head has disturbed the fibre—609. In plates crystals appear where a violent fracture takes place—610–612. Movement and carriage of the iron-plates might cause slight curvature: but the bolts were supposed to overcome that—613–616. Have no special modes of measuring the hardness of plates—617, 618. Hardness and toughness are very difficult to obtain together in plates—619–621. Saw several bolts at Shoebury which had broken at the shearing behind the front plate, where the nip is—622–626. Does not attribute the bolts breaking to the upsetting of the heads; but to some of the iron being too hard for bolts—627–630. At the second trial, shearing being prevented, the bolts were highly successful—631–633. Are making plates for Admiralty, 19 by 3 feet, and 10 inches thick—634, 635, at 36*l.* per ton—636. Planks of 18 inches wide would cost within 1*l.* per ton as much as plates—637. Can roll as large plates as any firm—642, 643. Attributes the improvement in the bolts at the second trial mainly to better iron; but also partly to bevelling, wooden packing and elastic washers—644; perhaps these causes operated equally—666, 667. These bolts were made of 4-inch iron, drawn down under the hammer, and turned afterwards; heads not upset—645, 646. With conical heads, bolts must be turned—647. Now charge per ton for iron plates, 7-inch, 30*l.*; 8-inch, 31*l.*; 9-inch, 33*l.*; 10-inch, 36*l.*—648. Can make plates 5½ feet wide; 10-inch plates, 3 feet wide up to 25 feet long—649. Hands in the record of experiments as to bolts or fastenings for shields—650. Prefers soft iron to steel for plates; has not succeeded in making a 7-inch steel plate—651, 652; has heard that Krupp has failed also—653, 65 Of the bolts which went, most were made by another firm, of iron which was too hard—655–659. The bolts in the second trial had the shank turned down more than in the earlier bolts, and had more endurance—660, 661. The hardness or softness of the iron depends equally on the original pig-iron, and on the course of manufacture—662–665. Denies the accuracy of a test at Shoeburyness, when one of their plates was declared to be harder than the others—668. Plates of varying thickness can be made of uniform quality—669.

(*Second Examination.*)

Submits designs: there is no doubt that a solid plate 12 feet by 8 feet 2 inches, would be the best to apply to this shield—1224; but because of its cost, substitutes two plates with corrugations dovetailed into each other; total thickness, 13 inches—1225–1228. Describes manufacture of these grooved plates—1229–1232, 1275. They would come to less money than a solid plate of 13 inches—1233–1235, 1245. Their density would be uniform—1236, 1237. Depth of groove, 5 inches—1238. Does not think the grooves would be a source of weakness—1239, 1240. Would fit the tongues and grooves together vertically, and so send them abroad—1241–1244. Anticipates cost would be under 1,500*l.*—1246, 1247. A solid plate of 13 inches would cost over 1,500*l.*—1248, 1249. Calculations have reference to an order for a considerable number—1251. Could make a plate 15 inches thick, after putting down the special plant—1252. Should pile the whole plate, and cut the port-hole out afterwards—1253. Details the nature and cost of his various designs—1254–1274, 1277, 1284–1286. The cost of a 12-inch plate, 12 by 8 feet, would exceed that of the present 12-inch plates of moderate size—1278, it would be 50*l.* to 60*l.* per ton—1281, 1283, 1316. Could now roll one up to 5 feet wide—1279; at 40*l.* per ton—1282. Front pla could be held together by horizontal clamps or clips stead of bolts—1287, 1288; or by a band all roun 1289, 1294, though a horizontal piece on the top wo be cheaper—1290–1293. Bolts would be required

WILSON, GEORGE—*cont.*
(*Second Examination*)—*cont.*
keep the strut up to the back—1295. Details the progressive price of thick plates—1298–1300. Cannot state a rule for the price by width beyond 6 feet—1304–1306, 1313, 1314; but the increase would be rapid—1307, 1308. Can roll a 15-inch plate 4 feet wide of good quality—1301–1303. Should not charge extra for 5 feet—1311; 2*l.* per ton extra for 6 feet—1312. Could make a plate 12 feet by 8 feet, with the proper machinery–1315. To increase the width, the furnaces must be altered—1317–1320. Rejects elastic backing and end-on stringers—1321–1323. To strengthen the Gibraltar shields would replace in half the number the front 5½-inch plate by one of 9 inches, and in the other half would put the 5½-inch plates thus obtained between the skin-plate and the 5-inch plate—1324, 1325. This would lengthen the bolts; but would retain present nuts and washers—1326; but a thicker plate in front would give a better shield—1327. A wadded mantlet would protect the gunners from bolts or fragments thrown to the rear—1329, 1330. In one of the American actions such a contrivance stopped the bolts, &c.—1332–1334. A thin iron screen would interfere with training the gun–1331. Two proposals for strengthening Gibraltar shield—*Appendix* iii.

WOODS.

1. *Fir.*
2. *Green-Heart.*
3. *Oak.*
4. *Poplar.*
5. *Preservation of.*
6. *Teak.*
7. *White Ants' Ravages.*

1. *Fir.*

Sulphate of copper can be driven through—*Clerk*, 943.

2. *Green-Heart.*

Difficult to know heart from sap—*Baskcomb*, 970.
Strong, but brittle—*Clerk*, 941.

3. *Oak.*

Hermetically sealed up, might last forty or fifty years, or longer—*Baskcomb*, 974, 975.
To preserve, would char the surface—*Clerk*, 925; and

WOODS—*cont.*
3. *Oak—cont.*

the bolt-holes, as oak does not agree with iron—*ib.* 926. Charred oak lasts long—*ib.* 927.

4. *Poplar.*

Sulphate of copper can be driven through—*Clerk*, 942.

5. *Preservation of.*

Has injected sulphate of copper, but the wood must be very young—*Clerk*, 942; and not hard. For English woods, surface-charring is best preservative—*ib.* 944.

6. *Teak.*

East India teak is best for backing—*Baskcomb*, 965, for its durability—*ib.* 966. It takes the dry rot from oak which has it in the vicinity—*ib.* 967, and is attacked by white ants—*ib.* 968. Some teak would not last 10 years; other (as Malabar or Moulmein) 20 years, or upwards—*ib.* 969. The lasting of teak backing is a doubtful question—*ib.* 971–973. Does not require any preservative—*ib.* 976. Decays more rapidly in a hot climate—*ib.* 985, 986. Doubts if it would last 40 years at Malta or Gibraltar—*ib.* 987. Great difference in quality in different teaks—*ib.* 999–1003.

Is so durable in itself as not to need any preservative—*Clerk*, 921; being oily, it preserves the iron in contact with it—*ib.* 923; where not covered with iron, should be painted—*ib.* 924. Backing of teak would be good for 30 or 40 years—*ib.* 927. Carefully pitched and sealed might last for 100 or 200 years—*ib.* 928, or for ever—*ib.* 932. The most durable wood witness knows—*ib.* 928. Never knew it rotten, unless from a defective tree—*ib.* 929; or with dry rot in it—*ib.* 931. It never shrinks—*ib.* 932; but it splinters—*ib.* 930, and its splinters are poisonous—*ib.* 941. Not proof against white ant—*ib.* 938, 939. Would outlast oak—*ib.* 945. Not the hardest wood, but the most durable—*ib.* 946. A solid block of teak is the best timber—*ib.* 947.
The backing would last 100 years—*Hughes*, 368.
Durability shown in the "Erebus"—*Appendix* xii.

7. *White Ants' Ravages.*

Only woods proof against are those containing certain aromatic oils—*Clerk*, 938, 939, as cedar—*ib.* 940. Ants could not get to wood shut in iron plates—*ib.* 940.

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